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THE INFLUENCE OF FORESTS ON CLIMATE AND WATER SUPPLY

(concluded)

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II. FORESTS AND WATER SUPPLY

Historical introduction.

The influence of forests on water supplies and stream flow has been recognized for centuries. A letter written to the Government of Venice, in 1608, explained that deforestation of the hinterland mountains was responsible for the flooding and silting of the lagoons [ref. in 16]. In France, Italy and Austria, local decrees against the clearing of watersheds were passed as early as the 14th century. The earlier publications on the subject were mainly in support of forest cover but a controversy soon began, particularly on the effect of forests on stream flow and floods. For example, in 1853 Belgrand wrote that no effects on stream flow and floods should be expected to follow afforestation. Von Wex, however, in 1873, attributed the reduction of water level in streams in the Danube basin to the effects of deforestation. A French engineer, Vallès, concluded that deforestation had no effect in causing floods in the Seine Valley. This sharp division of opinion called for a systematic approach to the problem which really began with the observations of Fautraut, Ebermeyer, Wollny, Ney and others on the influence of forests upon rainfall and the losses due to interception, transpiration and evaporation [refs. in 29]. The results of these investigations were used in the so-called indirect method which attempts to assess the effect of forests upon water supplies by measurement of precipitation and summation of all the factors responsible for dissipation, so that the balance available for surface run-off and percolation can be calculated. Investigations by the direct or hydrometric method began with the establishment of the Sperbelgraben-Rappengraben experiment [32] in Switzerland in 1900. Here two small catchment areas were selected in the headwaters of the Emme, one being well wooded and the other only partly wooded. Records have been kept since 1903 of the rainfall, snowfall, temperatures, and discharge by stream flow for both areas.

In the United States the effects of deforestation on stream flow were discussed in a report of the Patents Office in 1849. Early publications by Marsh, Hough [refs. in 16], Fernow [9] and others stressed the value of forests and in 1897 reservation for the protection of water supplies was recognized by the Act of June 4 [16]. There was an intensive campaign to conserve forest resources which were then being rapidly depleted, and exaggerated claims no doubt led to the establishment of an opposition which included Chittenden of the U.S. Army Corps of Engineers and Moor, Chief of the Weather Bureau, both of whom tried to show that forests had an insignificant effect upon water supplies and floods [refs. in 16]. Systematic observations began in 1909 with the establishment of the forest and stream flow experiment at Wagon Wheel Gap [3]. Here measurements of rainfall, snowfall, temperatures, evaporation, humidities and stream flow were carried out in two adjacent and forested catchments, A and B, for a period of 8 years, after which the timber on B was felled and the area burned over. Measurements continued as before for a further period of 7 years. The continuous series of observations on A formed a basis for assessing the effects of deforestation during the second period on the water supplies from B. In 1928 the MacSweeney-McNary Forest Research Act provided for research into methods for obtaining favourable conditions of water flow and the

prevention of erosion [43] and a large number of projects have since been established for the investigation of water losses and the measurement of water yields with different cover types.

Most of the work on forests and water supplies has been carried out in European countries and in the United States. Publications from other parts of the world are relatively few, and few of these again are based on acceptable experimental work. Recent papers by Staples [41, 42] and Gillman [34] in Tanganyika, and Wicht [45, 46] and Henrici [35] in South Africa form the basis for further study of water supplies there, and the systematic investigation of forest influences has begun at the Jonkershoek Research Station, set up in 1935 [45].

The hydrological cycle.

An understanding of the circulation of water between the atmosphere, the land and the oceans is the basis of the study of water supplies. The operation of the hydrological cycle, as it is called, is much more complex than appears from most accounts of it. In its most simplified form it can be expressed diagrammatically as done by Kittredge [16, fig. 1] and can be summarized by the equation:

$$R = P - (I + T + E + X) \pm S$$

where R is the run-off (surface run-off and spring flow), P the rainfall, I is interception by the canopy and ground cover, T is transpiration, E is evaporation, X is deep seepage, and S the change in storage during the period in question.

This equation can be applied at various levels—on a global scale to the water circulation over the earth as a whole, and on a smaller scale at the level of continent, region, district or single water catchment. It is assumed that the total amount of water on the earth's surface remains practically constant over long periods, and in the global circulation the factors X and S do not apply. For a smaller area, however, earth movements can alter the amount of deep seepage, while local climatic conditions, for example, prolonged drought, may influence the amount of storage so that for a particular period of time both X and S may be involved.

We are concerned here only with the effect of vegetation types on water supplies. Variations of deep seepage with vegetation cover are, of course, unknown, but they are probably small [16]. On the other hand vegetation will have considerable influence on the amount of soil moisture in storage over short periods, and this factor must be taken into account, particularly in dry climates and with level terrain. The action of various factors influencing the different phases of the water cycle is interrelated, as will be shown below, and modification of one part may affect another.

In the first instance, however, we shall deal with the stages separately and then proceed to a summation in which the over-all effects of changes in vegetation are discussed.

Rainfall.

If the total amount of water on the earth's surface remains constant over long periods it does not necessarily follow that the total amount of rainfall over land will also remain constant. Amount of rainfall depends upon rate of circulation as well as total amount of water available, and we know that on a smaller scale, rainfall varies considerably from year to year and in different periods. Climatic factors such as pressure changes and wind movements are largely responsible for variations in precipitation, but it has been claimed that changes in the type of vegetation may also play a part.

An account of comparisons of rainfall in and above forests with that in the open, and of rainfall in wooded and treeless districts, has been given in the first part of this article, and only a brief summary will be repeated here. Observations at the German Forest Meteorological Stations showed that the catch of gauges placed under trees varied from 52 to 89% of that in the open. At Nancy, a gauge constructed to encircle the trunk of a tree, and covering the same area as the crown gave 92% of the catch in the open. From observations made by Fautraut of precipitation above forests, Harrington [9] concluded that there is reason to believe that rainfall may be heavier over forests than over adjacent open country, although complete proof is lacking. Only certain specialized cases of occult precipitation in coastal and mountain forests seem to be well established experimentally.

On a larger scale, in dealing with wooded and non-wooded districts and regions, there are even greater practical difficulties in assessing the effect of degree of forest cover on the rainfall. Only tentative conclusions can be drawn from the types of experiments which have had to be used.

Becquerel [9], comparing rainfall at wooded and non-wooded stations in a district of the Department of Loiret, came to no definite conclusion about the effects of forest. Observations at Nancy gave 20% greater rainfall at stations in the forested area compared with those in open country, and in Germany it was noted that the field station of pairs of parallel stations in and adjacent to forest stands usually showed more rainfall than the average for extensive non-wooded regions near them.

Woeikov [9] has quoted a number of examples where heavily wooded districts have a higher rainfall compared with districts at similar latitudes but without forests. The fundamental objection to this method is that other factors besides forest cover influence rainfall and it is practically impossible to assess the effect of these, or alternatively to find areas which are comparable in all conditions likely to influence rainfall, with the exception of forest cover.

To avoid this objection, in some investigations the same area has been used throughout and the climatic and hydrological conditions compared for two different periods during one of which it was forested and in the other bare of trees. The best known examples of this method of approach are those given by Blanford and Troup in India, and Walter in Mauritius. Here the difficulty lies in assessing the possible effects of over-all changes in the climatic conditions between the two periods. This has been overcome to a great extent by the technique used in the Wagon Wheel Gap experiment, Colorado. On watershed A, which had forest cover in both periods, the average annual rainfall for the first period was 21·03 in. and for the second 21·16 in. The corresponding figures for B were 21·10 in. and 20·83 in., so that whilst the rainfall on A, with continuous forest cover, increased by 0·13 in. in the second period, that on B fell by 0·27 in. in the post-denudation period. Bates and Henry, however, do not consider this difference to be significant and say that it was probably due to greater exposure of the gauges on B after removal of forest cover.

In none of these investigations has it been satisfactorily demonstrated that the presence of forests increases the rainfall of the district in which they occur. Discussion of the results has led to very divergent opinions. Zon in his well-known publication 'Forests and water in the light of scientific investigation' [29] expressed the view that forests increase the rainfall, not only locally, but on a regional and continental scale. For local rainfall he accepted the conclusions of the earlier investigators whose results were favourable to forests. The weaknesses in technique of these investigations were exposed by Brooks, who thought that the effects of forest on local rainfall were slight [5]. On a continental scale Zon produces a calculation which claims to show that 78% of the rainfall over the land surfaces of the earth is derived from water vapour evaporated from land. Changes in vegetation, he thinks, will influence considerably the amount of precipitation by increasing or decreasing the amount of water vapour transpired. Brooks has a different calculation in which it is shown that two-thirds of the rainfall over land is derived from evaporation over the oceans, and changes of vegetation are therefore not of such importance as Zon had maintained. There is no proof for Zon's figure of 78%, and even if there were, it would still have to be demonstrated that for large areas forest-covered land returns a greater proportion of the rain falling on it to the atmosphere than would occur with other forms of cover. The combined loss of water by evaporation and transpiration from an area covered with vegetation is difficult to assess accurately, and so far it has not been possible to make comparisons of the losses with different vegetation types on similar sites. This again is not the end of the problem. From observations on the movement of air masses Holzman [12] has concluded that there is no evidence for assuming that a local addition to atmospheric moisture will result in an increase in local precipitation or even precipitation over land at all. He thinks that moisture returned to the atmosphere by evaporation from land is absorbed by dry air masses that are generally incapable of immediately releasing their moisture, which is eventually precipitated at sea. Moisture for precipitation over land, even the interior of large continents, is derived from maritime air masses.

It is clear that no definite conclusions can be drawn at present about the influence of forests on rainfall, and in hydrological calculations it will therefore have to be assumed that the presence of forest cover does not affect the value of the term *P*.

The dissipation of rainfall.

The factors responsible for the dissipation of rainfall must of course be considered in combination, but their operation will be more easily understood if they are first of all discussed separately.

Interception.

With any vegetation cover there will be a loss of precipitation through its interception by the canopy and litter and subsequent evaporation. The amount of rainfall intercepted in this way will be determined by the situation, the climate, and by the nature of the vegetation itself. In forests the rainfall recorded under the canopy may be considerably smaller than that outside. Beneath gaps in the canopy, or to the lee of shelterbelts, the rainfall may, however, be more than in the open.

The loss by interception is increased by low atmospheric humidity and by high evaporative power of the air. For example, an open stand of Ponderosa Pine of low foliage density intercepted 40% of the rainfall, this high figure being ascribed to the high evaporative power of the air in the locality (altitude 7,250 ft. in Arizona) [16, 40]. Interception is greater with light rains of short duration than with heavy or prolonged rains. Small drops of rain have to be combined into larger ones of a certain size before they will drop from the leaves. There is also a limit to the amount which can be held by the foliage, and with some showers which do not exceed the interception storage capacity of the vegetation the interception is almost 100%. With heavier rains the % interception decreases to a nearly constant figure of between 10 and 40% according to the character of the vegetation [16]. Seasonal variations can often be correlated with changes in foliage and in climate.

There have been numerous experiments to measure the interception by forest trees. The early German observations showed for a number of stations that from 11 to 48% of the rainfall was intercepted in the canopy. At Nancy, where the catch with the normal apparatus was 84% of that in the open, a gauge encircling the trunk of the tree and covering the area of its crown recorded 92% [9]. Kittredge gives a table, summarizing the results of experiments in the United States, in which interception varies from 3 to 48% of the total rainfall.

The species, the stand density, age and successional status are factors to be considered in comparing the interception of different vegetation types. Zon quotes a number of papers in which it is shown that coniferous forests intercept more rainfall than broadleaved, the average figures being 39% for Spruce and 12% for broadleaved trees. Ney [ref. in 29] computed the average interception for Beech forests at 15, for Pine 20 and for Spruce 33%. In California, Munns [ref. in 16] found the dense Scrub Oak intercepted 31 compared with only 3% for the thin-foliaged chamise. A mixture of Spruce and Balsam Fir in Maine intercepted 37%, but Spruce with light-foliaged Paper Birch held only 26% [16]. Variations with age are well illustrated by Buhler's observations on Beech in which a 20-year-old crop held 2, a 50-year-old crop 27, a 60-year-old 23 and a 90-year-old 17% [ref. in 29]. With natural succession, Kittredge has shown from the results of a number of experiments that as would be expected, interception increases to a maximum with the climax type.

Comparisons of the amount of rainfall intercepted by forests and other forms of vegetation are few and none of them are really satisfactory. Interception is dependent on so many factors that it is difficult to isolate the action of any one of them, and even if this could be done in a particular instance the results would not of necessity be applicable in other localities with different combinations of conditions. Figures for interception by some other forms of vegetation are given by Zon, Meinzer [39] and in *Bull.* 397 *of the U.S. Department of Agriculture* [43]. Zon concludes from Ney's computations that forests on the whole intercept more rainfall than other vegetation types. Forests very often will intercept more than alternative forms of cover on the same site, but this will depend upon the type of forest and the type of cover, and such generalizations are misleading, as are also lists of interception figures of different vegetation types without details of their composition, density, age etc. and of the local climatic conditions.

Evaporation.

The rate of evaporation from land surfaces is dependent upon a combination of climatic factors, such as solar insolation, air temperature, humidity, and wind movements, and of soil factors such as soil temperature, texture, retentive capacity, and moisture content at different depths. The vegetation is of importance because of its modifying influence upon these basic conditions, and, in general, an increase in the density of cover gives a reduction in the rate of evaporation. Evaporation from the surface of soil saturated with water corresponds closely to that from a free water surface. The ratio between the two has been found to vary from 0·8 to slightly over 1 on burned-over land [16]. Woodruff found that with drying sands a stage followed complete submersion in which the surface

was moist and water was being withdrawn from the surface pores, and that this corresponded to a ratio of 0·79. The ratio was 0·71 when the larger pore spaces beneath the surface were being emptied, and when the smaller, 0·22. After the surface had dried the ratio fell to 0·03 and changed at a decreasing rate [ref. in 16]. This experiment indicated that movement of water through the soil in the liquid phase ceases when the surface is dry and further evaporation takes place by diffusion which occurs at a rate inversely proportional to the depth. (It will require 3 times as long for the second inch to dry as for the first, and so on.)

With well-drained soils, with which we are normally concerned, the surface will not remain saturated for very long. It will be appreciated, then, that the actual evaporation from the soil may be very different from that recorded from a free water surface or by an atmometer. The methods by which evaporation data have been obtained should therefore be taken into account. Munns has shown the different results which can be obtained by using different techniques. A comparison over a period of four years in a stand of Jeffrey Pine gave the evaporation as measured from a free water surface as 80% of that in the open, with an atmometer 83, and with a soil box 66. For chaparral the corresponding figures were 75, 62 and 37% [ref. in 16].

In Ebermayer's experiments losses from actual soil specimens were recorded, but these were always at saturation point and hence do not show the evaporation that would occur under natural conditions [ref. in 29]. Comparing woods and open country, the evaporation in the summer, from a forest soil without a litter cover, was found to be 39%, and with a litter cover 15·4%, of the evaporation from a similar soil outside. Harrington's analysis of the results of German forest meteorological observations for the years 1879–88 showed that for an average rainfall of 34·3 in. the average evaporation from a water surface was 12·7 in. in the open compared with 5·4 in. within the forest [9]. The greatest difference occurred, as would be expected, in summer. Evaporation expressed as a % of the rainfall, increased rapidly to a maximum in April and descended slowly to a minimum in the winter months in both fields and woods, but more steeply in the fields, so that the greatest reduction of evaporation in woods comes when the greatest loss would occur outside.

Bates has shown that with windbreaks the reduction of evaporation is proportional to the density of the windbreak and that the reduction, and the distance to which it is appreciable, increase with wind velocity [1, 16]. With a dense windbreak the area of greatest reduction will be close to the trees, but with a narrow belt, open at the base, it may be as much as five times the height of the break to the leeward.

Many comparisons have been made, using atmometers as a rule, of the evaporation under different conditions of cover. Kittredge gives a table of the results of experiments in the United States in which evaporation, expressed as a percentage of that in the open, varies from 10% with a dense swamp forest of Gum, Ash and Yellow Poplar, to 94% with thin-foliaged chamise. The following measurements, made in Washington and Idaho, show the trend with natural succession; bunch grass/rim rock 100%, prairie 61%, Ponderosa Pine 43%, Western Larch/Douglas Fir 32%, Western Red Cedar 29% [16, 44].

The results of experiments with atmometers etc. indicate that less water will be lost through evaporation from forested land than from land with other forms of cover. Exact computation of the water evaporated from a particular area is, however, very difficult and there have been very few attempts at it. Zon quotes estimates made by Ney in which the evaporation from the soil in a Beech forest with litter is given as 6% of the rainfall, and without litter as 15%. A Pine forest with litter evaporated 15% and without litter 24% [ref. in 29]. The corresponding figures for Spruce were 8·1 and 19·5%. Evaporation from an open field was not accurately determined by Ney but he estimated it at about one-third of the rainfall. From bare sandy soil the evaporation is about one-third and from heavier soils about one-half, according to results obtained by Ebermayer and Wollny [refs. in 29]. As comparisons of the loss by evaporation from forest and other vegetation types these results are not of much practical use, but none better are available.

Transpiration.

The greatest water losses very often occur through transpiration, and a great deal of work has been done on the estimation of transpiration, particularly in the United States. The transpiration rate of a plant is influenced by the temperature, the humidity of the air, air movements, intensity of

sunlight, and soil moisture. It is possible by laboratory and small field experiments to demonstrate the action of these various factors, but it will be appreciated that the calculation of average transpiration losses from an area of land covered by vegetation is practically impossible.

Experiments and calculations by Höhnel, Wollny, Ney and others, done at the end of the last century, are still very often quoted [refs. in 29]. Höhnel, in 1880, estimated from his experiments that Elm transpired 43% of the rainfall, Beech 25% and Birch 40%. Woolny, from a series of experiments extending over six years, estimated that Spruce transpired, on the average, 38% of the rainfall, and Beech 28, but that both species transpired at about the same rate during the vegetative season. Using Höhnel's figures, Ney calculated that Beech would transpire the equivalent of 10·8 in. of rainfall, Spruce 8·3 in., and Pine 2·9 in. when the total precipitation was 31·5 in. These estimates of transpiration losses were based upon measurements of the transpiration of potted plants. Transpiration per acre of forest land was then calculated by comparison of the amount of dry leaf substance. The objections to this method are obvious and it is clear that comparisons of losses from different vegetation types by this method are of little value. (Estimates for agricultural crops, made by Wollny, are quoted by Harrington.)

Henrici, in South Africa, has recently carried out a series of experiments to calculate the amount of water transpired by various plant communities. She concludes from a comparison of various types of forest with sour mountain grassveld, that tree associations on the whole have a lower transpiration per unit of fresh matter than grasses. The absolute amount of water lost per unit of soil under grasses may, in some circumstances, exceed the loss under sclerophyllous trees and be about equal to that under soft-leaved small-leaved trees. Deciduous trees would have a higher rate of transpiration than grasses.

The technique adopted is based on the weighing of twigs, within a few minutes of cutting, on a sensitive torsion balance. Wicht has, however, strongly criticized these experiments and the deductions made from them [46] and it certainly seems that Henrici's methods are not satisfactory, and her conclusions therefore suspect.

A great deal of work has been done in the U.S.A. on the transpiration rate of different crops, but here again there are no comparative experiments which would give the water losses, under natural conditions, of different forms of vegetation on the same site. As Meinzer points out, existing data on transpiration ratios are of little practical use to the water engineer and hydrologist.

A summation.

The ways in which rainfall is dissipated are interrelated, and the study of the effect of changes in vegetation upon them in combination is probably the method of approach most likely to give results. Kittredge gives a diagrammatic representation of the changes in I, E, and T which are likely to occur throughout the life of a tree crop [16, figs. 20, 21]. At the beginning, transpiration and interception will be zero, and these will increase most rapidly during the period of most rapid growth. They will become smaller in the mature and ageing stand as the canopy opens out. Evaporation will be at a maximum at the beginning of the rotation and will then decrease to a minimum at the end of the period of most rapid growth, rising again in old age. The combined loss will start at the same point as the initial value for evaporation, rise to a maximum at the culminating point of rapid growth, and then fall away. By drawing a line representing the average rainfall, the change in the amount of water available for streamflow throughout the life of the crop is apparent.

The so-called indirect or analytical method of assessing the influence of vegetation on water supplies depends upon the summation of the separate losses due to interception, evaporation and transpiration. We have seen the range of values possible with various species and with differences in climatic and other locality factors, which make it difficult to calculate average values for comparison of various vegetation types. Then there is the almost insoluble problem of designing an experiment from which the amount of evaporation and transpiration from an area can be calculated so that this can be related to measurements of rainfall in the same terms. Comparisons of losses by this method have, however, been made and examples are given by Zon. The total annual loss from a Beech forest was estimated at 61·5% of the rainfall, from a Pine forest 48·6, from Spruce 75·6, the average, for what it is worth, being 61·9%. Figures for other crops, produced for comparison, were 132% for an overflowed meadow, 42·9 for a potato field, 80·3 for a grain field, with an average of 61·6% [refs.

in 29]. Troup repeats these figures with the conclusion that combined loss by interception, evaporation and transpiration is on the average about the same for forests and other crops, although much depends locally upon the type of forest and crop [24]. This may have given a false idea of the value of the indirect method. In fact the method is of little or no practical use, and comparisons such as those given by Zon are, for the reasons given above, virtually meaningless.

A more practical approach to the calculation of total water losses has been made in America, where numerous methods have been devised to measure 'consumptive use'. (Consumptive use is defined as the sum of water used by the vegetative growth of a given area in transpiration or building of plant tissue and that evaporated from adjacent soil, snow, or intercepted precipitation on the area in any specified time.) These include volumetric methods, lysimeters, and measurement of water-table fluctuations and available heat [39].

Volumetric measurements are based upon measurements of inflow, outflow and change in storage volume in tanks which are placed in the vegetation type to be investigated, filled with soil and allowed to assume the same type of cover. The tanks have to be carefully designed and conditions for exposure carefully regulated, but it is claimed that checks by other methods have shown the technique to be reliable.

There are obvious difficulties in the application of this technique to large plants, and for forest vegetation the measurement of consumptive use by field plots is considered to give more reliable results. Water input is calculated from rainfall measurements and the outflow is measured at the border of the plot. The accuracy of the method depends largely upon the limitation of deep percolation, a factor which, unfortunately, is difficult to check.

In the lysimeter method, the equipment consists of a cylinder, open at the top and bottom, filled with soil and sunk to ground level. Water percolating through the soil column is run off and collected in a neighbouring pit. Consumptive use is calculated as the difference between water absorbed at the surface and that measured at the bottom.

The fluctuations of ground-water level have been used to estimate consumptive use, and a formula for its calculation has been evolved by White [ref. in 39] from simultaneous observations on tank experiments and measurements of fluctuations.

A large amount of information on consumptive use has already been collected and this method of approach, with improving technique, may make it possible in the near future to estimate, with reasonable accuracy, the losses from different vegetation types.

Run-off and storage.

The balance of rainfall remaining after reduction by interception, evaporation, and transpiration, is potentially useful for domestic purposes. It appears in the form of stream flow, derived partly from immediate surface run-off and partly from underground seepage, and also as ground water which is fed by deep infiltration. The ratio between immediate run-off and infiltration is of the greatest importance in the management of water supplies. It is usually more important to obtain a suitable ratio with a smaller total yield in the form of stream flow than to have a larger yield but with an uncontrollable run-off. We have, therefore, to consider how changes in vegetation can affect both the total yield of water and the ratio between run-off and infiltration.

In the management of water supplies the aim is, generally, to keep the immediate surface run-off to the minimum, thereby checking erosion and reducing floods. The latter are not only mechanically destructive but they may squander a large proportion of the year's rainfall in a few weeks and be followed by a period of small flow or no flow at all. The efficacy of forests in controlling surface run-off is widely recognized. In the first place the canopy, by breaking the force of heavy rainfall, reduces compacting of the soil. The litter also helps in preventing compacting, and by its capacity to absorb water, and by mechanical restriction of the surface flow, it increases the opportunity of infiltration occurring rather than run-off. Infiltration rate and percolation depend upon the structure, texture and moisture content of the soil, and on the turbidity of the water infiltrating. Soil structure is improved by forest litter and it seems well established that forest cover promotes the maximum infiltration capacity [24]. The infiltration rate under a 60-year-old stand of Pine in Ohio was reported to be seven times that in a near-by field with similar soil. In the

Sperbel-Rappengraben experimental area, tests have shown that forest soils absorbed 100 mm. of precipitation in one to two minutes whilst hard pasture soil required one to five hours [31].

At a lower level in the soil the deeper root channels of trees will assist rapid deep infiltration. When geological conditions are favourable this may increase seepage to springs, but if the formation is impervious, and is within the rooting zone, this water will eventually be lost to transpiration.

Forest and water supplies in flat terrain.

The problem of vegetation types and water supply are very different in highland areas and in level country, and these will be considered separately.

In level country or with gentle slopes, control of run-off at the expense of total yield of water does not usually have to be considered. The maximum yield of water and at the same time the best conditions for all-the-year-round supply will be obtained with vegetation that gives the smallest loss by $I + E + T$. It has been shown by Ototsky, Henry and others that the water level under certain forests in level country is lower than that under fields. This is most noticeable where the annual rainfall is low and presumably is due to the greater combined water losses with forest [refs. in 29]. Zon points out that in tropical regions soil under forest has a greater moisture content that bare soil outside. This may be so but the actual ground-water level will be lower. Staples has found in Tanganyika that the removal of savannah-forest vegetation often results in a rise in the water table. Investigations at the Trostyanetsk Forest Experimental Station in Russia have shown that with sandy soils and sandy plus clay soils forests use considerably more water than herbaceous vegetation and draw on soil, subsoil and ground water. Generally speaking the presence of forests in flat country is of no value in the conservation and management of water supplies, and in certain situations may have definite adverse effects.

Forests and water supplies in hilly country.

Where there are appreciable slopes the problem of control of run-off arises and the ratio between surface run-off and infiltration becomes important. A number of attempts have been made to assess the effect of different types of vegetation on rate of run-off and total yield of water by the measurement of stream flow. The first of these was the Sperbel-Rappengraben experiment in Switzerland, which has already been mentioned. Results published in 1911 showed that in the completely forested area the average precipitation was 62·6 in. per annum and in the partly forested Rappengraben 65·1 in. The total run-off for the former was 37·1 (59·3% of the rainfall) and from the latter 40·4 in. (61·9% of the rainfall).

This experiment has been criticized on the grounds that two catchments, no matter how carefully selected, cannot be completely comparable in all respects other than forest cover. The Wagon Wheel Gap experiment at Colorado overcomes this objection by using the same area and comparing the run-off for a period during which it carried forest cover with the run-off for a period after denudation. The stream flow on a similar and adjacent watershed was also measured as a check on differences between the two periods which might be due to over-all climatic changes and not the removal of vegetation. Before deforestation watershed B had an average run-off 1·7% greater than that of A and this was increased to 17% after denudation. In the Coweeta Experimental Forest, North Carolina, an area with an annual rainfall of about 60 in. gave before deforestation a run-off equivalent to about 20 in. and after deforestation in 1941–42 a run-off of 36 in. The thinning of forest vegetation has been shown by Hoover and others to increase the total yield of water and the cutting of stream-bank vegetation alone gave significant increases in flow at Coweeta [38, 33].

There is a good deal of evidence indicating that higher total yields of water can be expected as a rule if forest vegetation is removed. However, as soon as run-off becomes appreciable the danger from flooding and erosion has to be weighed against the value of higher total yields. In the Sperbel-Rappengraben experiment, total run-off was not significantly higher in the partly forested area but detailed analysis of stream flow showed very much heavier floods after rain and considerably greater losses of soil. At Wagon Wheel Gap the spring flow after denudation increased to a peak of 35% in excess of normal in the third year, falling gradually to 22% in the seventh year. (It should be remembered that the area was left undisturbed after the initial felling and burning.) A good example

of the effects of deforestation is available from the Southern Appalachians, where the run-off from a number of small watersheds has been compared graphically, using readings taken at intervals of two and a half minutes. A completely denuded area produced a graph with a twenty-minutes' base and a 50% peak, whilst a well-forested area gave a base exceeding one hundred minutes with a peak of only 7%. With pasture cover, the base was sixty minutes and the peak 26%. For serious floods the maximum flow, expressed in second-ft. per sq. mile of drainage area, was 13 to 56 for forest, 332 to 900 for abandoned fields, 579 for overgrazed pasture and 1,263 to 1,434 for the completely denuded area [16, 30]. An experiment with run-off from plots under different forms of treatment was carried out at Holly Springs, Miss., from October 1931 until September 1933. During this time 131 in. of rain fell, about 28% occurring in heavy torrential rains and 20% in rains of moderate intensity. Surface run-off from a cultivated cotton field with rows parallel to the slope amounted to 58% of the total rainfall and in individual rains was as much as 95%. Soil losses were 195 tons per acre for the two years. A contoured cotton field gave a run-off of 47% and barren plots in an old field 48%. The run-off from unburned broad sedge plots in an old field was only 1% and from an Oak forest was less than 1%. For individual rains in these two plots the run-off did not exceed 5·05 and 3·10% [43]. From these experiments and many others it is clear that the effect of removal or disturbance of vegetation in hilly regions on the rate of run-off and erosion is a factor to be carefully considered.

Vegetation types and the management of water supplies.

It seems probable, although definite proof is difficult to obtain, that the combined water losses ($I + T + E$) are likely to be higher, in most situations, with forest cover than with alternative forms of vegetation or land use.

On level sites the removal of forest vegetation will very often improve the ground water-supply. There are numerous examples of the application of this technique. Gillman, however, has pointed out that this will only occur when the geological strata are fairly level and there is an impervious layer near the surface. It should not be assumed that a rise in the ground-water table will necessarily follow the removal of vegetation.

In highland catchment areas forest cover is very often the natural vegetation and has been retained for its protective value. There is no doubt that in many areas grass, although it may not achieve quite the degree of control of run-off that would be possible with forest cover, would nevertheless be effective enough. The total yield of water would very likely be higher with a grass cover. The difficulty, however, is to prevent overgrazing and burning, both of which reduce the infiltration capacity of the soil. It is undoubtedly this administrative problem which has prevented widespread attempts to replace forests with grassland in water catchment areas. Nevertheless, more consideration will have to be given in the future to obtaining the maximum beneficial use of all the resources of water catchment areas and this may require in some areas a change in vegetation and in existing methods of management and conservation [47].

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(Reprints of the above article are available from Central Sales Branch, Aberystwyth, at 2s. each.)

ABSTRACT SECTION

0. GENERAL FORESTRY

01. MATHEMATICAL AND STATISTICAL ANALYSIS

1561. GRIFFITH, A. L., and RAM, B. S. **The silvicultural research code. Vol. 2. The statistical manual. (Being the application of statistical methods to silvicultural research in India.)** Forest Research Institute, Dehra Dun. 1947. pp. viii + 214. 33 refs.

Part I gives general principles and includes only such mathematics as is found absolutely essential. Part II describes the design of typical forest experiments. Part III consists of examples of the working out of typical forest experiments.

02. TEXTBOOKS. DIRECTORIES

1562. BROOKS, R. L. **West African forestry.** Thomas Nelson & Sons Ltd., London. 1949. pp. 70.

A booklet for use in West African schools, with simple exercises at the end of each chapter.

1563. GOBEIL, A. R. [Editor]. Annuaire forestier de la province de Québec. **[Forestry Directory of the Province of Quebec.]** Canada Indexing and Publishing Co., Quebec. 1949. pp. 625. [F.E.] Price $5.00.

Contains, in addition to a directory of all those practising or teaching forestry, or engaged in the timber trade and other forest industries, the following sections, all in French and English:—forestry in 1948; the pastoral letter of the Bishop of the Gulf of St. Lawrence, on the forests; the forest dominion of Quebec; fire protection; insect outbreaks; commercial species of Quebec and their principal uses; timber identification key; forest industries of Quebec; scaling felled timber; grading of lumber, transport of forest products; abbreviations used in the timber trade and transport.

05. PERIODICALS

1564. [STEFFERUD, A. [Editor].] **Trees.** *Yearb. Agric. U.S. Dep. Agric.* 1949. pp. 944.

Contains a series of articles on all the most important aspects of forestry in the U.S.A., including farm woodlands, the national forests, diseases and insects, fire-fighting, forest wildlife and wood utilization.

06. SOCIETIES. ASSOCIATIONS. CONFERENCES

See also *For. Abstr.* 11 (Nos. 1594–5, 2032).

1565. TROMP, H. Leistungen, Aufgaben und Bedeutung der wald- und holzwirtschaftlichen Verbände der Schweiz. **[Activities, tasks, and importance of the Swiss organizations connected with forestry and the timber industry.]** *Schweiz. Z. Forstw.* 100 (7/8), 1949 (325–46). 20 refs. [G.f.]

1566. **Third World Forestry Congress: general report.** Third World Forestry Congress, Helsinki. 1949. pp. 22.

Summarizes discussions and recommendations on general forest policy, development and silviculture of virgin forests, biology and technique of afforestation, forest genetics, aerial forest surveys, methods of determining increment, comparative study of inventory methods, catchment areas and water supplies, economics and policy of exploiting virgin forest, economics and policy of afforestation, relation of forestry to agriculture in rural economy, measures designed to ensure sustained yield, employment and unemployment in forestry, forest utilization, relationship of forestry and industry, woodwaste in the forest and industry, wood chemical industries, preservation of wood, prefabricated wooden houses, tapping of Pines for rosin and turpentine, and the compilation of a multilingual dictionary.

1567. Union Internationale des Instituts de Recherches Forestières: 10ième Congrès, Zürich, 1948—Comptes Rendus. **[Proceedings of the 10th Congress, Zurich, 1948, of the International Union of Forest Research Organizations.]** Zürich. 1949. pp. 267. Individual papers are noticed separately under their subjects.

1568. **5th session FAO Conference, 21 November 1949: Proposed amendments to the constitution and rules of procedure.** FAO, Washington. No. *C* 49/6, 1949. pp. 4.

1569. L'organisation des Nations Unies pour l'Alimentation et l'Agriculture, la place de la Division des Forêts et Produits Forestiers dans cette organisation et les résultats qu'elle attend du IIIe Congrès forestier mondial. **[FAO, the place of the Division of Forestry and Forest Products in it, and the results which it hopes for from the 3rd World Forestry Congress.]** *Proc. World For. Congr.* No. 2, 1949 (5–12). [F.e.]

1570. **Report of the Forestry and Timber Utilization Conference for Asia and the Pacific, Mysore, India, 28 March—8 April, 1949.** FAO, Washington. 1949. pp. 13.

Cf. *For. Abstr.* 10 (p. 556).

1571. **FAO: International Forestry and Timber Utilization Conference for Asia and the Pacific.** *Emp. For. Rev.* 28 (3), 1949 (261–4).

A brief account of the principal discussions and findings of the Conference.

07. EDUCATION AND RESEARCH. ARBORETA. EXPERIMENTAL FORESTS

See also *For. Abstr.* 11 (Nos. 1722, 2033, 2158, 2396).

1572. PHILBROOK, D. A. **Activities of the Northeast Research Centre.** *Pulp Paper Mag. Can.* 50 (9), 1949 (125–6). *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1022 (A–1), 1949.

A brief account of the activities of the Northeast Pulpwood Research Centre at Gorham, N.H., a regional organization sponsored by private industry and serving pulpwood companies in the northern New England States, New York and Pennsylvania.

1573. FEHÉR, D., and KISS, L. A Müegyetem Erdömérnöki Osztályának botanikus Kertje Sopronban 1923–1948. **[The botanical garden of the section of forest engineers of the Hungarian Technical University in Sopron [: its history and development].]** *Erdész. Kisérl.* 58 (3/4), 1948 (116–28 + 11 photos). [Hu.g.e.]

1574. DELEVOY, G., and GALOUX, A. Les arboretums de l'administration des eaux et forêts. **[Arboreta maintained by the [Belgian] state forest administration.]** *Bull. Soc. for. Belg.* 56 (10), 1949 (416–20).

Gives name, natural region, location, altitude, date of foundation, area and ownership (State or commune) of 43 arboreta.

09.1. *Forest History*

1575. LAVAUDEN. Historique de la forêt domaniale de la Grande-Chartreuse. **[History of the state forest of the Grande-Chartreuse.]** *Bull. Soc. for. Franche-Comté* 25 (11), 1949 (422–33). [F.]

09.2. *Pre-history. Pollen Analyses, etc.*

See also *For. Abstr.* 11 (Nos. 1667, 1669).

1576. WENNER, C.-G. **Pollen diagrams from Labrador.** *Geografiska Annaler, Stockholm* 29 (3/4), 1947 (137–374). 184 refs. [E.]

A detailed report on a study made in 1939, divided into the following sections:—(1) The geography of the area investigated (66 pp.). (2) Pollen and spore types (8 pp.). (3) Methods of preparing and examining samples (29 pp.). (4) Surface samples (7 pp.). (5) Description of sites, deposits and pollen diagrams, with discussion of the light they throw on vegetation changes (33 pp.). (6) Comparisons between Labrador and similar parts of the northern hemisphere (11 pp.). There are over 60 pp. of tabulated data and 7 pp. of bibliography.

In the forest region, the pollen diagrams principally record the expansion of the conifer forest and extensive paludification. The sequence of strata shows that periods of relative dryness have alternated with wet ones. The stratigraphical system of 'moist, dry, moist' coincides with the pollen analysis system of forest variation:—increasing growth, culmination, decreasing growth.

1577. HANSEN, H. P. **Pollen content of moss polsters in relation to forest composition.** *Amer. Midl. Nat.* 42 (2), 1949 (473–9). 3 refs.

A comparison of the composition of a Douglas Fir/White Oak (*Quercus garryana*) community in Oregon with the modern pollen deposition in the area, revealed the degrees of over- and

under-representation of the anemophilous arborescent species present and the influence of exotic species in distorting the pollen statistics. On the basis of the number of trees of 1 in. d.b.h. and over, Douglas Fir constituted 42% of the stand and was represented by 76% of the total pollen; White Oak constituted 47% and was represented by 4% only. Further correlation with abundance showed that trees of 10 in. d.b.h. and over are more accurately represented; on this basis, Douglas Fir was under-represented by *ca.* 4% and Oak by *ca.* 7%. When basal-area was considered, Douglas Fir constituted 68% and Oak 23%, resulting in over-representation of Douglas Fir pollen by 8% and under-representation of Oak pollen by 19%. Lowland White Fir (*Abies grandis*) with 2·4% of trees 10 in. and over and a pollen average of 2·8% was fairly accurately represented. Bigleaf Maple was under-represented on all bases of comparison, probably because it is not wind-pollinated. Arborescent species not represented in the sampling area provided an average of about 16% of the pollen, mostly by the prevailing west winds from the Coast Range some miles away. [Cf. *For. Abstr.* 5 (p. 167.]

09.4. *Forest Statistics*

See also *For. Abstr.* 11 (Nos. 2201–6, 2210).

1578. **Forest resources—Far Eastern and Pacific regions.** *Unasylva* 3 (4), 1949 (140–1).

1579. DUERR, W. A., JAMES, L. M., and STOVER, W. S. **The new forest survey of Mississippi.** *Sth. Lumberm.* 179 (2245), 1949 (54–5, 58, 62).

Compares and discusses the results of 2 surveys of forest resources in Mississippi, i.e. that of 1932–35 and that of 1946–48.

1580. Quadros estatísticos. **[Statistical tables.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (409–87 + 5 tbls.). [Port.] P.R.

This section of the report consists of a series of tables giving statistics (up to the year 1947) on various aspects of the Brazilian forests and forest industries, including the following:—forest areas, forest reserves, reforested areas, the forest products industries, production and consumption of forest products, exports. In an appendix a number of Brazilian timbers are listed with information on their physical and mechanical properties.

1581. Valor económico y función social de nuestra riqueza forestal. **[Economic value and social function of our forest wealth.]** *Boletín de la Dirección General de Investigaciones, Estadística y Censos* 2 (21), 1948 (408–20). 10 refs. [Span.]

Includes some statistics on ownership of forests, distribution of species, forest products (including quebracho) and their value in Argentina.

09.7. *Monographs of Individual Forest Regions*

See also *For. Abstr.* 11 (Nos. 1563, 1619).

1582. LUZU, G. Forêts et produits forestiers en Sarre. **[Forests and forest products of the Saar.]** *Rev. Bois Appl.* 4 (6), 1949 (4–10). [F.]

1583. PAVARI, A. Il problema forestale. **[The forest problem [in the province of Grosseto].]** *Ital. agric.* 86 (2–3), 1949 (151–61). [It.] E.M.B.

1584. CRIVELLARI, D. La regione pugliese nel suo aspetto fisico e forestale. **[Physical and forestry aspects of Apulia.]** *Ital. for. mont.* 4 (4), 1949 (195–212). 11 refs. [It.]

1585. BAVIER, J. B. Schöner Wald in treuer Hand. **['Beautiful forest in faithful hand'.]** Verlag H. R. Sauerländer & Co., Aarau. 1949. pp. 327 + 25 plates. [G.] Price [£1. 9*s.* 6*d.*].

An abundantly illustrated, popular, general work on Swiss forests and forestry, issued under the auspices of the Swiss Forestry Association. The title is from a poem by Gottfried Keller.

1586. DANHOF, G. N. Siamese impressies. **[Siamese impressions.]** *Tectona* 38 (5), 1948 (239–81). 3 refs. [Du.e.]

The author was one of the F.A.O. Commission in Siam [cf. *For. Abstr.* 10 (No. 2404)], and gives an account of Siamese forests and forestry.

1587. BURGER, D. Bos en bosbeheer in Suriname. **[Forests and forestry in Dutch Guiana.]** *Tectona* 38 (5), 1948 (311–7). [Du.]

1588. HUGHES, J. H. *et al.* **Handbook of natural resources of British Guiana.** Interior Development Committee of British Guiana, Georgetown, Demerara. 1946. pp. 243 + 11 (index) + 9 photos.

The section on forest resources (pp. 45–190) includes descriptions of the various forest areas with their estimated timber content and possible methods of exploitation and extraction; descriptions of the principal commercial timbers; and the existing forest industries, the whole illustrated by numerous tables, graphs and diagrams in the form of appendices.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere. Meteorology*

11.14. Precipitations. Evaporation. Humidity

See also *For. Abstr.* 11 (No. 1616).

1589. RYCROFT, H. B. **Random sampling of rainfall.** *J. S. Afr. For. Ass.* No. 18, 1949 (71–81 + 1 dgm.). 18 refs. [E.]

Mainly an account of an investigation carried out at the Forest Influences Research Station, Jonkershoek, to determine the extent of the variability of rainfall during 1945 and 1946 over a stream catchment of 67 acres. Fourteen rain gauges were distributed at random over the area. Rainfall was so unevenly distributed that anything from 9 to 553 gauges would have been required to obtain a mean monthly value with a standard error of 2·5%. For the whole of 1945, 13 rain gauges would have been required, and 31 for 1946. The statistical significance of the differences between the amounts recorded by any two gauges are given. No correlation was found between altitude and amount of rainfall. The results given and the conclusions drawn could not have been obtained had the rain gauges not been distributed at random.

11.2. *Climate and Microclimate*

See also *For. Abstr.* 11 (Nos. 1661, 1675, 1677, 1705).

1590. HUBER, B. Die Jahresringe der Bäume als Hilfsmittel der Klimatologie und Chronologie. **[The annual rings of trees as evidence in climatology and chronology.]** *Naturwissenschaften, Berlin* 35 (5), 1948 (151–4). 15 refs. [G.] O.R.S.

1591. AUBRÉVILLE, A. Ancienneté de la destruction de la couverture forestière primitive de l'Afrique tropicale. **[The antiquity of the destruction of the primitive forest cover of tropical Africa.]** *Bull. agric. Congo belge* 40 (2), 1949 (1347–52). [F.]

Develops a theory put forward in a book by the same author [cf. *For. Abstr.* 11 (No. 134)], that the process of desert formation as a result of human activity, particularly the use of fire, has been going on since prehistoric times, probably for a period of 100,000 years.

1592. IABLOKOFF, A. KH. Particularités du microclimat des trous à gelée. **[Peculiarities of the microclimate of frost pockets.]** *Rev. for. franç.* No. 6, 1949 (274–7). [F.]

11.4. *Soil*

See also *For. Abstr.* 11 (No. 1817).

1593. AALTONEN, V. T. Boden und Wald, unter besonderer Berücksichtigung des nordeuropäischen Waldbaus. **[Soil and forest, with special reference to northern European silviculture.]** Paul Parey, Friedrichsstrasse 227, Berlin SW 68. 1948. pp. 457. 32 pp. of refs. [G.] (*Forstwissenschaft des Auslandes: Schriftenreihe zur Vermittlung fremdsprachlicher Werke der forstlichen Forschung und Praxis.*)

This work is intended to provide a unified review of present knowledge of the soil as the basis of forest production, with the regional restriction given in its title and a further restriction in that peat and other soils of organic origin are excluded. The subject-matter is arranged under the headings: (1) A general review of N. European conditions from the point of view of forest soil science (geology and climate, soil formation and soil types, and forests). (2) Effects of the forest upon the soil (physical properties, chemical and biological conditions). (3) The fertility of forest soils, with subsections on the rôles of physical properties, mineral constituents, humus and

microbiological conditions, mycorrhizae, and pH (most of which are discussed both in general and in regard to forest regeneration), on changes in fertility caused by leaching etc., fire, and 'soil fatigue', and on the assessment of soil and site quality. (4) Soils and silviculture, with subsections on competition, the effects of silvicultural measures on fertility, and fertilizing. The work concludes with an extensive bibliography and separate author and subject indexes.

1594. Comptes rendus de la Conférence africaine des sols, Goma (Kivu) Congo Belge 8–16 Novembre 1948. II. **[Proceedings of the African Soil Conference held at Goma (Kivu), Belgian Congo, 8–16 Nov. 1948. II.** *Bull. agric. Congo belge* 40 (2), 1949 (1049–1980). [F.]

Cf. *For. Abstr.* 11 (No. 36). This fascicle deals mainly with the phenomena and causes (largely the practice of shifting cultivation) of soil degradation in different regions of tropical Africa.

1595. ROBERTSON, W. A. **A brief note on the African Soil Conference, 1948.** *Emp. For. Rev.* 28 (3), 1949 (251–3 + 4 photos).

11.41. Soil Physics

See *For. Abstr.* 11 (Nos. 1599, 1604, 1612–3, 1623).

11.42. Soil Chemistry

1596. UGARTE LAISECA, J. Fitoquímica forestal. Segunda parte. Estudio general y de los elementos de los grupos A y B. **[Plant chemistry in the forest. Second part. General considerations and study of elements of groups A and B.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 20 (44), 1949. pp. 109 + 1 map. [Span.span.e.f.g.]

The second report in this extensive investigation of the chemical nature of forest soils [cf. *For. Abstr.* 10 (No. 155)] consists mainly of further results of analytical studies. Soil reactions and soil toxicity are discussed, and results of the following experiments are given:—Group A, i.e. elements essential to plant growth:—Amounts of C, S, P, Mg, and K respectively were determined in soils growing various woody species. Group B, i.e. elements essential to the growth of certain species:—Soil content of Ca, Cl, Na, Si, Mn, and Fe, was determined as above and the amounts of these elements in the ash of numerous species were also calculated.

1597. WHITE, J. W., HOLBEN, F. J., and JEFFRIES, C. D. **Cellulose-decomposing power in relation to reaction of soils.** *Soil Sci.* 68 (3), 1949 (229–35). 6 refs. [Pennsylvania Agricultural Experiment Station.]

In order to investigate the relationship between rate of cellulose decomposition and soil reactions, experiments were carried out with 3 different acid soils treated with various amounts of $Ca(OH)_2$ and the data obtained were compared with the results of similar studies made in field plots. In the former case, soil reaction was the only variable other than the relatively small amounts of added lime. In the latter case a number of other variables were present. Significant correlations beyond the 1% level were found to exist between soil reaction and cellulose-decomposing power of the laboratory soils. The maximum cellulose decomposition of all 3 soils occurred at pH 7·2. No significant correlation was found between soil reaction and cellulose-decomposing power of the field-plot soils. Significant correlations, however, were found to exist between cellulose-decomposing power and organic-matter content and between cellulose-decomposing power and nitrifying capacity. *From authors' summary.*

1598. LAZAREV, A. A. Sostav gumusa v serykh, opodzolennykh pochvakh pod lesom i pod sel'skokhozyaystvennoy kulturoy. **[Composition of the humus of grey podzolic soils under forest and under agricultural crops.]** *Dokl. Akad. Nauk SSSR.* 65 (5), 1949 (741–4). 6 refs. [Russ.] A.C.P.

Experiments were made to compare the composition of the humus fraction of grey podzolic soils under forest and in agricultural use (probably for centuries), the samples being taken from the topmost 0–15 cm. of soils in 5 different parts of the European part of the U.S.S.R. and differing also in their parent materials and degree of leaching. The differences in the humus fraction are expressed in terms of the C contents of the several fractions isolated, by Tyurin's method of analysis, in % of total organic C content. Results, given in a

table, showed that both quantitative and qualitative differences existed between the humus of forest and field soils. In all cases the total organic C content was considerably higher in the forest soils. Qualitatively, the C contents (in % of total organic C) of the alcohol/benzene extracts, and of the hydrolysate obtained with 1·0 *N* H_2SO_4, were somewhat higher in the forest than in the field soils. Much sharper contrasts were shown in the relative humic and fulvic acid contents: forest soils all had a lower humic-acid/total-humus ratio and a higher fulvic-acid content than field soils; in the former the ratio of humic-acid C to fulvic-acid C was always < 1, in the field soils > 1. A ratio of the former type is characteristic of the process of podzolization, while the latter type is usually associated with meadow-steppe soils, and it is considered that agricultural use has deflected the course of soil formation in this direction.

1599. **Changes in soil on afforestation of agricultural land.** *For. Res. India Burma* 1946–7, [1948?] (22–5).

The soils of agricultural land at Dehra Dun which was afforested with different species, have been examined every 5 years since 1927 in order to determine any changes. The 5th examination was carried out in 1947 in the *Shorea robusta*, *Pinus longifolia* and *Acacia catechu* working circles. The only change observable in previous examinations had been an increase in organic matter, total and nitrate N, in the top 3 in. only. The latest examination, however, revealed the following facts:—(1) As previously observed, the organic matter had accumulated in the top 3 in. only, but it seemed to have attained equilibrium at a value of about 1·5% of organic carbon during the previous 5 years. (2) Winter examination of soil gases showed an accumulation of CO_2 in the subsoil in all the working circles. This is of particular interest in connexion with *S. robusta*, since failure of recruitment of this species appears to be correlated to some extent with an accumulation of CO_2 in the soil, particularly during the rains. (3) Under *S. robusta*, the subsoil (especially the 3–18 in. layer) showed a marked lowering of pH and increase in exchangeable acidity. Examination of soils from other *S. robusta* forests showed similar conditions. These phenomena were much less marked under *P. longifolia*.

11.43. Biology of Soil, including Mycorrhiza

See also *For. Abstr.* 11 (Nos. 1816, 1896–7).

1600. Erdtman, H. Skogskemi. [**Forest chemistry.**] *Papp. Trävarutidskr. Finl.* 31 (14; 15), 1949 (253–6; 271–5). [Sw.] P.R.

Discusses research on the chemistry of humic acids, of vegetable matter (e.g. dead leaves and needles) in the soil, of micro-organisms of mycorrhizae with particular reference to corticrocin, the yellow pigment in *Corticium croceum*, of lichens, of substances present in fungi and lichens which may inhibit the growth of *Fomes annosus*, of antibiotic substances in timbers, especially softwoods, and of growth substances and synthetic weedkillers.

1601. Gallego y Quero, F. Compendio de microbiología del suelo. Segunda parte. Bacterias del suelo. [**A short review of soil microbiology. Second part. Soil bacteria.**] [*Bol.*] *Inst. for. Invest. Exp. Madrid* 20 (45), 1949. pp. 132 + 4 dgms. + 2 gphs. 116 refs. [Span.]

An introductory chapter deals with the morphology, physiology and classification of bacteria, while the main part of the bulletin is devoted to:—(1) descriptions of (*a*) autotrophic bacteria, (*b*) heterotrophic bacteria, and (*c*) cellulose-destroying bacteria; (2) methods for quantitative study of soil micro-organisms; and (3) studies of the number of bacteria in soils and its variation.

1602. Colligan, D. **A study of organisms in soil samples from southern Indiana which inhibit the growth of *Escherichia coli* and *Staphylococcus aureus*.** *Butler Univ. bot. Stud.* 9 (1–11), 1949 (9–20). 11 refs. A.P.B.

In the 16 samples of soil studied for this investigation, a greater number of organisms producing a substance inhibitory to *E. coli* and/or *S. aureus* were found in the samples taken at a depth of 2–3 in., than in surface samples. Soils from beneath *Quercus montana* and *Juglans nigra* were found to be the richest source of inhibitors. There is a greater variation from tree to tree in the number of inhibiting organisms found in the subsurface soil than in the surface soils. The actinomycetes isolated gave a larger total amount of inhibition than did the bacteria and fungi; the bacteria gave

larger zones of inhibition than did the fungi. The organism producing the largest single zone of inhibition was an actinomycete isolated from the subsurface soil beneath *Juglans nigra*. *E. coli* was found to be more susceptible to antibiotic substances produced by the inhibitors than was *S. aureus*. *From author's summary.*

1603. OVERGAARD, C. **An apparatus for quantitative extraction of nematodes and rotifers from soil and moss.** *Natura Jutlandica, Aarhus* 1, 1947–48 (271–7). 5 refs. [E.e.]

11.45. Geological Conditions

1604. NICOLÁS ISASA, A. Formación y destrucción del suelo. Primera parte. **[Formation and destruction of the soil. First part.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 20 (46), 1949. pp. 197 + 18 photos. 76 refs. [Span.]

Part I of this treatise consists of chapters under the following heads:—(1) Principal minerals that contribute to soil formation. (2) Principal rocks from which soils originate. (3) Determination of the mineral composition of rocks and soils. (4) Transformation of rocks. (5) Physical and mechanical properties of the soil.

1605. LÅG, J. Undersøkelser over opphavsmaterialet for Østlandets morenedekker. **[Studies on the parent material of the moraine deposits of Østland (S.E. Norway).]** *Medd. norske Skogforsøksv.* 10 (1) (Ser. No. 35), 1948. pp. 223. 12 pp. of refs. [Nor.e.]

Reports on investigations, preliminary to a series of studies of Norwegian soils, to elucidate: (1) relations between the petrological composition of moraine material and local bedrock; (2) some properties (pH, buffer capacity, exchangeable bases, content of readily soluble P and K) of parent rocks in comparison with the moraine materials derived from them. The English summary includes explanations of figures and tables and of Norwegian terms used in connexion with these.

11.47. Maintenance of Favourable Soil Conditions

See also *For. Abstr.* 11 (Nos. 1719, 2265).

1606. **Der Wald braucht Kalk. [The forest needs lime.]** *Forstw. Praxis, München* No. 3, 1948. pp. 78. [G.]

A semi-popular booklet addressed chiefly to the private forest owner and consisting of a symposium of articles by various authors on different aspects of liming in the forest.

1607. GANSSEN, R. Bodenkundliche Beiträge zur Kalkdüngung im Forstbetrieb. **[Pedological notes on [the effects of] liming in the forest.]** *Mitt. ZentInst. Forst- u. Holzw.* No. 8, 1949. pp. 6. 13 refs. [G.f.e.] P.R.

Observations made over a period of 40 years showed in many instances that there was still a high content of lime in lime-manured soil. In some cases the reduction of the lime content to a fraction of that present soon after liming, is attributed to leaching; the increase of soil acidity and corresponding decrease of lime content is less in areas with broadleaved undergrowth than in those with pure Spruce stands. Where CaO contents are high and pH values low 40 years after liming, in spite of the presence of pervious sands of the podzol type, this can be attributed in part to the presence of hardwoods. On account of the high degree of leaching, a repetition of liming may be necessary, and admixture of hardwoods, chosen for ecological and economic reasons and not confined to Beech, should be practised. Several moderate lime applications at a rate of about 4,000 kg. limestone per ha., are preferable to a single heavy one; the application of marly limestone (on account of its high percentage of clay) or dolomitic marl (for its Mg content) is desirable. *From author's summary.*

1608. AALTONEN, V. T. **Influence of forest on soil fertility.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (21–2).

Investigations in Finland indicate that neither the depth of the humus layer nor that of the A horizon is dependent on which of the 3 main tree species, Pine, Spruce, or Birch, is growing over it. The fertility of forest soil is here primarily bound up with the qualities of the mineral soil, particularly its moisture. In the sparse virgin stands of Northern Europe, the humus layer is largely composed of the litter of ground vegetation.

1609. SCHNELL, R. Sur quelques cas de dégradation de la végétation et du sol observés

en Afrique occidentale française. **[Some cases of degradation in vegetation and soil observed in French West Africa.]** *Bull. agric. Congo belge* 40 (2), 1949 (1353–62). 8 refs. [F.]

Deals chiefly with the deforestation of the Nimba range in the Ivory Coast and its effect on the evolution of soils (mainly a process of laterization), and a note on similar phenomena in Fouta-Djallon.

1610. HUMBERT, M. La dégradation des sols à Madagascar. **[Soil degradation in Madagascar.]** *Bull. agric. Congo belge* 40 (2), 1949 (1141–62). [F.]

Causes and suggested remedies. The phenomena of soil degradation in Madagascar are primarily due to the destruction, by felling or burning, of the natural vegetative cover. Only 10% of the original forest or bush survives. Native systems of burning and shifting cultivation are the chief causes.

11.49. Soil Types

See also *For. Abstr.* 11 (No. 1598).

1611. PALLMANN, H., RICHARD, F., and BACH, R. Über die Zusammenarbeit von Bodenkunde und Pflanzensoziologie. **[Collaboration between soil science and plant sociology.]** *C.R. Congr. int. Union For. Res. Organ., Zürich 1948*, 1949 (57–95). 4 refs. as footnotes. [G.]

A further exposition of the matter covered by a previous paper [see *For. Abstr.* 10 (No. 2425)].

1612. CLINE, M. G. **Profile studies of normal soils of New York: I. Soil profile sequences involving brown forest, gray-brown podzolic, and brown podzolic soils.** *Soil Sci.* 68 (3), 1949 (259–72). 12 refs.

1613. DUCHAUFOUR, P. Les sols à horizon de gley. **[Soils with a gley horizon.]** *Rev. for. franç.* No. 8, 1949 (357–61). [F.]

A short explanation of the meaning of the word 'gley', and a discussion of the adverse influence of gley horizons on forest growth.

1614. AUBERT, G. Observations sur le rôle de l'érosion dans la formation de la cuirasse latéritique. **[The rôle of erosion in the process of laterization.]** *Bull. agric. Congo belge* 40 (2), 1949 (1383–6). 11 refs. [F.] [Cf. *For. Abstr.* 11 (No. 1609).]

11.6. *Hydrographical Conditions. Water and Soil Conservation*

See also *For. Abstr.* 11 (Nos. 1591, 1594, 1789, 1791, 1795, 1817, 2424.)

1615. FOSTER, E. E. **Rainfall and run-off.** Macmillan Co., New York. 1948. pp. xix + 487. 200 refs. Price $9.00.

A comprehensive treatment of the science of hydrology as related to rainfall and run-off, and the place of statistical method therein. Examples are drawn mainly from the portion of the U.S.A. between the Rockies and the Atlantic.

1616. FONT, I. La extraordinaria importancia del arbolado en el caudal de aguas de Canarias. **[The unusual importance of the forests in the water régime of the Canary Islands.]** *Boletín mensual climatológico del Centro Meteorológico de Tenerife* 3 (34), 1947 ([7–9]). [Span.] L.M.O.

Discusses the influence of the forests on precipitation in the Canary Islands. Experiments were made at the Izana observatory to estimate the effects of vegetation on condensation. Two rain gauges were installed, one with live sprays of native Broom suspended above it, and a second without vegetation. On days of rainfall from high clouds, catch of precipitation was about equal in both gauges. On days of rain with low cloud enveloping the station, catch of moisture in the first gauge was considerably more than in the second, the proportion increasing with the intensity of the rainfall. On days of low cloud and no rainfall, catch in the second gauge was invariably nil, while that in the first gauge varied.

1617. KUZIN, P. S. O vliyanie lesa na vodnỹ rezhim i gruntovỹe vodỹ. **[On the influence of forest on the water régime and on groundwater.]** *Priroda, Moskva* 38 (7), 1949 (33–40). 28 refs. [Russ.] A.C.P.

Reviews some Russian and other European literature on the effects of forest on groundwater, concluding that conflicting views are to be explained by the variations which can occur, even within one and the same climatic region, in the effects themselves.

The effects of large blocks of forest must in any case be distinguished from those of a balanced system of shelterbelts, ley farming and

reservoirs as now projected for the steppe region. Forests, it is claimed, have favourable influences on all phases of the water cycle except loss of groundwater by transpiration, whereas the most that can be claimed from this point of view in favour of open steppe and fields is that they expend relatively little groundwater in transpiration. Shelterbelts and ley farming are therefore expected to be complementary in function, the fields transpiring less than an equivalent area of forest proper, the narrow belts securing better distribution of the available water, i.e. creating a more balanced water regime, modifying the environment to the benefit of the intervening fields, reducing erosion and promoting more stable stream flow, particularly in the spring flood season.

1618. DEIGHTON, F. C. **Agriculture and forestry in relation to soil and water conservation in Sierra Leone.** *Bull. agric. Congo belge* 40 (2), 1949 (1293–8). [E.]

1619. VOGT, W. Los recursos forestales de la América Latina. **[Forest resources of Latin America.]** *Maderil, B. Aires* 21 (250–2), 1949 (23–5; 23–6; 21–4). [Span.]

Considers the problem of soil degradation in Latin America, discusses some of its causes, and reviews briefly the state of the forests and soils in various Central and South American countries.

1620. FOURNIER, F., and HENIN, S. Influence des facteurs climatiques sur l'érosion du sol. **[The influence of climatic factors on soil erosion.]** *Bull. agric. Congo belge* 40 (2), 1949 (1375–82). [F.]

The authors have worked out, for a number of large rivers all over the world, the relation between mean annual precipitation and erosion measured by the mean quantity of solid matter transported by the rivers per unit (sq. km.) of the catchment area. The effect of vegetative cover on this relation is discussed.

1621. BARBOSA, J. C. DE MATTOS HORTA. Fixação de dunas e seu aproveitamento. O problema das dunas de restinga de Marambáia. **[Fixation and utilization of sand dunes. The problem of the dunes of Marambaia Island.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (312–33). 13 refs. [Port.] P.R.

Gives a brief study of the dunes of the island of Marambaia, south-west of Rio de Janeiro (i.e. formation, climate, vegetation), outlines methods of forming artificial dunes by means of palisades or barricades, and lists native and indigenous species suitable for sand-dune fixation. [Cf. *For. Abstr.* 9 (No. 1563).]

1622. NIGGLI, R. Le reboisement du bassin de réception de la Baye de Montreux. **[The afforestation of the catchment of the Baye de Montreux.]** *Schweiz. Z. Forstw.* 100 (6), 1949 (283–96 + 5 photos). [F.g.]

The Baye de Montreux is a mountain torrent liable to severe floods which endanger the town of Montreux. The article describes the measures taken to reduce flooding, particularly by planting the steep slopes in the upper part of the catchment area, with some indication of costs.

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

See also *For. Abstr.* 11 (Nos. 1851–3, 2346).

1623. KRAMER, P. J. **Plant and soil water relationships.** McGraw-Hill Book Co. Ltd., New York, Toronto, London. 1949. pp. 347. 37 pp. of refs. Price $4.50.

Includes the following sections:—(1) Historical introduction (17 pp.). (2) Soil-moisture relations (33 pp.). (3) Factors affecting the supply of soil moisture (23 pp.). (4) Measurement and control of soil moisture (30 pp.). (5) Structure and growth of roots (28 pp.). (6) Factors affecting the development of root systems (35 pp.). (7) Root and stem pressures and exudation phenomena (23 pp.). (8) Processes concerned in water absorption (23 pp.). (9) Factors affecting the absorption of water (33 pp.). (10) The absorption of solutes (21 pp.). (11) Absorption deficits and their effects on plants (29 pp.). Bibliography (37 pp.). [Cf. *For. Abstr.* 11 (Nos. 1786–7).]

12.11.1. *Metabolism. Plant Constituents. Photosynthesis. Translocation. Sap Flow. Transpiration. Growth Substances*

See also *For. Abstr.* 11 (Nos. 1596, 1600, 1602, 1660, 1734, 1786–7, 1873 *et seq.*, 1903, 2154–5, 2162–5, 2176–80, 2183–93, 2199).

1624. FORTUNATO, A. D. Composición química de algunas especies de la región subantártica del país. **[Chemical composition of some species from the subantarctic region of the country.]** [*Publication of*] *Instituto Tecnológico, Dirección General de Industria Manufacturera, Buenos Aires* (*Series A*) No. 1, 1949 (13–6). 8 refs. [Span.] P.R.

Nothofagus dombeyi, *N. pumilio* and *Araucaria araucana* in Argentina.

1625. MARINI-BETTOLO, G. B., DEULOFEU, V., and HUG, E. Los flavonósidos del Ombu (*Phytolacca dioica* L.). **[The flavonol glycosides of *P. dioica*.]** *Cienc. e Invest., B. Aires* 5 (7), 1949 (304–5). 3 refs. [Span.] A.P.B.

An investigation of yellow crystals deposited on cooling by aqueous extracts of the leaves of *Phytolacca dioica*, proved them to be a mixture of glycosides, the aglycones of which are quercetin and dimethyl quercetin or 'ombuína'.

1626. OLAECHEA, V. P. Contribución al estudio fitoquímico del *Rhamnus alaternus* L. Reconocimiento cualitativo y determinación cuantitativa de antraheterósidos. **[The phytochemical study of *Rhamnus alaternus* L. Qualitative tests and quantitative determination of anthraheterosides.]** *Revista de la Facultad de Ciencias químicas, La Plata* 20, (1945) 1947 (229–35). 11 refs. [Span.] O.R.S.

1627. THOMAS, W. D. E. **Radioactive isotopes—an introduction to their properties and applications to plant nutritional studies.** *Rep. agric. hort. Res. Sta. Univ. Bristol 1948*, 1949 (114–23).

12.11.2. *Reproduction. Propagation. Growth. Development*

See also *For. Abstr.* 11 (Nos. 1650, 1732, 1764).

1628. CORTI, R. Sul dioicismo di *Idesia polycarpa* Maxim. **[The dioecism of *Idesia polycarpa*.]** *Nuovo G. bot. ital.* (*n.s.*) 55 (4), 1948 (446–95 + 5 photos). 24 refs. [It.it.e.] O.B.D.

1629. BURGOS, J. C. Propagación de algunas especies indígenas leñosas de origen subtropical cultivadas en La Plata. **[Propagation of some native woody species of subtropical origin cultivated in La Plata.]** *Rev. argent. Agron.* 14 (3), 1947 (210–23). 11 refs. [Span.] E.M.B.

Notes on Argentine woody species which have been propagated in the arboretum of the Facultad de Agronomia, La Plata. These are classified as (1) species which regenerate from seed (*a*) spontaneously, and (*b*) in the nursery under glass, (2) species which can be propagated from root cuttings.

1630. RUIZ LEAL, A., and BURGOS, J. C. Floración precoz en un forestal indígena cultivada en Mendoza. **[Precocious flowering in a native forest species cultivated in Mendoza [: 2-year-old potted plants of *Pterogyne nitens*].]** *Rev. argent. Agron.* 16 (2), 1949 (88–90). 4 refs. [Span.] E.M.B.

1631. BURGOS, J. C., and CACERES, M. R. Noticia complementaria acerca de la propagación vegetativa del viraró (*Pterogyne nitens* Tul.), por trozos de raíz. **[Supplementary note on the propagation of *Pterogyne nitens* from root-cuttings.]** *Darwiniana, B. Aires* 8 (4), 1949 (519–20). 4 refs. [Span.] A.P.B.

Describes a method of propagating *Pterogyne nitens* in Mendoza, Argentina, by taking root cuttings from seedlings. Seedlings of January 1947 were transplanted into the greenhouse at the beginning of the cold season. Root cuttings were taken from selected plants in the following spring. Roots were divided into sections 2–3 cm. long and planted vertically in pots with the proximal portion uppermost. No results were observed in the spring of 1948, but by January 1949 shoots had appeared varying in length from 4 to 6 cm., some originating from the proximal and some from the distal portion of the cutting.

1632. HUNZIKER, A. T. Raíces gemíferas en algunas plantas leñosas argentinas. **[Gemmiferous roots in some Argentine woody species.]** *Rev. argent. Agron.* 13 (1), 1946 (47–54). 6 refs. [Span.span.] E.M.B.

Notes on some Argentine plants capable of forming, on the roots, adventitious buds originating either spontaneously or from traumatic causes.

1633. Cozzo, D. Nuevos casos de raíces gemíferas en plantas leñosas argentinas. **[Fresh examples of the occurrence of gemmiferous roots in Argentine woody species.]** *Rev. argent. Agron.* 14 (3), 1947 (247–54). 5 refs. [Span.span.] E.M.B.

1634. Doran, W. L., and McKenzie, M. A. **The vegetative propagation of a few species of Elm [*Ulmus carpinifolia* var. Christine Buisman and *U. japonica*].** *J. For.* 47 (10), 1949 (810–2).

March root cuttings of Buisman Elm with ends of cuttings exposed, had 97·5% survival compared with 17·5% for cuttings wholly covered; they made about twice as much growth in 92 days as December cuttings did in 167 days. Japanese Elm can be propagated by softwood stem cuttings taken in June and treated with indolebutyric acid, but this method was unsuccessful with Buisman Elm.

1635. Boer, S. de. Het stekken van *Acer*. **[Propagation of *Acer* by cuttings.]** *Jaarb. ned. dendrol. Ver.* 16, 1947 (116–8). [Du.] (*Meded.* No. 4 *van 'De Proeftuin' te Boskoop.*)

Trials at 'De Proeftuin', Boskoop, with horticultural varieties of *Acer palmatum*, showed that good rooting (90–100% of the cuttings) could be obtained with cuttings taken at the end of a growth period (i.e. end of May, or of August for varieties having two such periods per year), treated with 0·1% α-naphthaleneacetic acid in talc, and planted in 2 : 1 peat litter/sand in the greenhouse (and possibly in cold frames, which proved satisfactory in one experiment). Difficulties were experienced, however, in getting the plants over their first winter, and further experience is necessary in this respect.

1636. Kruyt, W. De invloed van groeistoffen, vitaminen, traumatinezuur, aethyleenchloorhydrine en warm water op het enten van enkele sierteelt-gewassen. **[The influence of growth substances, vitamins, traumatic acid, ethylene chlorhydrin and warm water on the grafting of some ornamental plants.]** *Jaarb. ned. dendrol. Ver.* 16, 1947 (83–109). 46 refs. [Du.e.] (*Meded.* No. 3*a van 'De Proeftuin' te Boskoop.*)

Reviews literature on this subject and describes extensive preliminary investigations at 'De Proeftuin', Boskoop, in 1942–4, on treatments (of stock, scion, or both) of horticultural varieties of *Picea abies*, *Juniperus chinensis* and *Rhododendron* hybrids, with a variety of substances (β-indolyl-acetic and α-naphthalene-acetic acids, the Ca salt of traumatic acid, yeast extract, vitamin B, glucose, warm water, and ethylene chlorhydrin, alone or in combination) and by various methods (lanolin paste, standing or immersing in aqueous solutions, brushing on to cut surfaces, vapour treatment). Results are tabulated in detail, table headings being given in Dutch and English. For the two species of conifers, on which only β-indolyl-acetic acid in varied concentration in lanolin paste was tried, optimum concentrations of the growth substance (as judged by callus development at the graft union) were 1% for *Picea abies* and 0·5% for *Juniperus chinensis*. Improved callus development was shown by some of the Rhododendron hybrids after some of the treatments, but further research is necessary.

1637. Boer, S. de. De invloed van koud en warm water, groeistoffen en aethyleenchloorhydrine op het enten van *Rhododendron*. **[The influence of cold and warm water, growth substances and ethylene chlorhydrin on the grafting of *Rhododendron*.]** *Jaarb. ned. dendrol. Ver.* 16, 1947 (110–5). 1 ref. [Du.] (*Meded.* No. 3*b. van 'De Proeftuin' te Boskoop.*)

None of the treatments tried gave sufficient improvement to be worth while in practice.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance. Cytology*

See also *For. Abstr.* 11 (Nos. 1696, 1716, 1728–9, 2184).

1638. Larsen, C. S. **Forest genetics.** *Proc. World For. Congr.* No. 1, 1949 (30–8). 7 refs. [E.f.]

A brief review of the objects of forest tree breeding, methods used and progress made up to the present time.

1639. Sewandano, R. Veredeling van bosbomen. **[Forest tree breeding.]** *Tectona* 39 (1), 1949 (1–95). 103 refs. [Du.du.e.]

A review, largely from Scandinavian literature.

1640. SARVAS, R. **Forest genetics in Finland.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (44–5).

A short account of the Forest Tree Breeding Foundation founded in 1947.

1641. JOHNSSON, H. **Experiences and results of ten years' breeding experiments at the Swedish Forest Tree Breeding Association.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (39–40).

1642. HOUTZAGERS, G. Génétique et sélection dans la sylviculture néerlandaise. [**Genetics and selection in Dutch forestry.**] *Additional Paper World For. Congr.* No. 2, 1949. pp. 9. [F.e.]

Deals principally with Poplar, but also with Elm, Oak, Robinia and Scots Pine.

1643. GUSTAFSSON, A. **Seed plantations—their structure and genetic principles.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (37).

Points out the difficulties involved in the establishment of 'seed orchards' [cf. *For. Abstr.* 8 (pp. 667–71)]. The number of unrelated clones in an orchard must be rather high, at least 20 or 30 for each provenance in order to avoid the dangers of inbreeding. The induction of premature flowering by means of various devices will automatically cause a selection for genes favouring early flowering, while the negative correlation of capacity for vegetative growth and early and profuse flowering will hamper the practical application of seed orchards. Long experiment is necessary before general use of this method can be recommended.

1644. KARPINSKI, J. **The problem of races and polyploids of forest trees, as also the problem of the stand types as genetical problems in forestry.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (41–3).

Attempts to set out the lines of research which ought now to be followed, particularly the study of desirable races and polyploids in the biocoenosis where they originated.

1645. GUINIER, P. Sapins et sapinières. [**Firs and Fir woods.**] *Bull. Soc. for. Franche-Comté* 25 (11), 1949 (439–45). [F.]

Discusses the great variability of different races of Silver Fir and their importance to the forester.

1646. MEYER, J. Über spitzkronige Kiefern in Ostpreussen und im Schwarzwald. [**On pointed-crowned Scots Pines in East Prussia and the Schwarzwald.**] *Forstarchiv* 20 (1/2), 1944 (1–15). 11 refs. [G.g.]

Briefly discusses the general distribution of narrow, pointed-crowned forms of *Pinus sylvestris* and proceeds to analyse the development and structure of this crown type in examples from E. Prussia and the Schwarzwald, using the same method of study as that previously applied in the author's investigation of crown development in the broad-crowned Brandenburg Scots Pine [see *For. Abstr.* 1 (245)], concluding with a discussion of the possible roles of heredity and environment in the development of the narrow-crowned types.

The Schwarzwald type is very straight-stemmed and retains a pronouncedly pointed crown in old age: the E. Prussian crown form tends to become less marked in old age, but the straight stem is already formed by then, as, in spite of interrupted growth owing to a more variable climate, it maintains its crown form in youth. Both forms had more living 1st-order branches, a more regular angle of branching, and therefore a more regular crown shape than had the Brandenburg Pine. The E. Prussian is more liable than the Schwarzwald form to show crooked growth on very unfavourable sites. This disadvantage, however, is inconsiderable in view of its good growth on ordinary N. German sites, where its increment is decidedly superior to the even narrower-crowned and finer-branched types of more easterly origin.

How far heredity and environment respectively influence the development of the narrow, pointed-crown type, is a question that cannot be answered with any certainty until plantation trials are about 100 years old.

1647. VINOGRADOV, N. P. Gornÿe sosnyaki i problema obleseniya melovÿkh i izvestnyakovÿkh obnazhenii. [**Mountain stands of *Pinus sylvestris* and the problem of afforesting chalk and limestone exposures.**] *Priroda, Moskva* 38 (9), 1949 (69–71). [Russ.] A.C.P.

In the southern parts of the Central Russian hills there occur, besides the patches of Pine

wood that grow on sandy river terraces, other small Pine woods on chalk and limestone declivities of river valleys in the hills. These appear to represent a physiological race, thought to be a tertiary relict. It is stated that attempts to grow this race on sandy soils have failed, as have attempts to grow that of sandy soils on calcareous sites. At the Slonovsk forest nursery, Kursk Province, seed of the calcipete race germinated well under the same conditions as those in which the ordinary race is cultivated, but all the seedlings subsequently died.

When investigating limestone exposures in the upper Don basin and exposed chalk along the R. Oskol, the author found no regeneration of ordinary Pine in spite of the presence of seedbearing stands on river terraces near by. In part of the Slonovsk forest, however, there are calcipete Pines bearing abundant seed and regenerating successfully, as shown by the presence of seedlings 3–30 years old, not only under the parent tree but also on exposed chalk about 50–100 m. distant.

The calcipete Pine is of special interest in connexion with the great shelterbelt project, as there are thousands of hectares of exposed chalk, through which flow the rivers Ural, Volga, Don, and S. Donets, to be planted with shelterbelts or afforested. Stands of calcipete Pine are known in the Altai, S. Urals, the Volga region, and the Donets and Oskol basins. The last named are the most important for S. Russia. It is intended to take special steps for the preservation of such stands as a source of seed.

1648. RYDESKOG, A. Flammigheten hos fanerbjörk. **[Flamy figure in veneer Birch.]** *Skogen* 36 (17), 1949 (229). [Sw.]

Of 39 stems from a small Birch stand, 28 were found to show some degree of flamy figure, and further sampling of the trees left standing revealed that these too had an unusually high % of flamy wood. It is suggested that this stand should be of interest as a source of seed for breeding.

1649. ALLARD, H. A. **An analysis of seedling progeny of an individual of *Quercus saulii* compared with seedlings of a typical individual of the White Oak (*Q. alba*) and a typical Rock Chestnut Oak (*Q. montana*).** *Castanea* 14 (3), 1949 (109–17). 4 refs.

Leaves of *Quercus saulii* seedlings from an individual in Arlington County, Va., were compared with those of a typical parent of *Q. alba* and *Q. montana*. The data indicate that *Q. saulii* is not a species in the true sense but a heterozygous hybrid form.

1650. KRUG, C. A., and ALVES, A. SILVEIRA. ***Eucalyptus* improvement.** *J. Hered.* 40 (5–6), 1949 (133–9; 143–9). 15 refs. O.R.S.

A brief summary of results obtained by the Paulista Railway Company, Brazil, in their Eucalyptus-breeding research programme. The project was planned and started in 1942, the main lines of investigation being:—(1) taxonomy, (2) flower morphology and biology, (3) seed constitution, (4) cytology, (5) genetics, (6) vegetative propagation, and (7) species trials and breeding. [Cf. *For. Abstr.* 10 (No. 152).]

1651. SILVY-LELIGOIS, P. Observations sur le tremble en Maurienne. **[Notes on the Aspen in Maurienne (Savoie).]** *Rev. for. franç.* No. 8, 1949 (362–70 + 2 photos). 16 refs. [F.]

Describes the distribution of *Populus tremula* in the valley of the Arc, and discusses the two races which appear to exist—the mountain race which grows on well-drained slopes, and the plains race which grows on the valley bottom and even in the river. The distinguishing characters of the two strains are tabulated. The mountain race is straight and well formed, with large, smooth leaves, and shows early and active self-pruning. The plains race is inclined to be crooked, with flattened crown, and small leaves often tomentose on the lower side; dead branches often subsist for a long time.

12.12. Teratology

1652. VEER, E. J. VAN A. DE. Een teratologisch novum? **[A new teratological phenomenon?]** *Tectona* 38 (5), 1948 (307–10). [Du.]

Describes several cases of abnormal growth in *Pinus merkusii*.

12.13. Embryology

1653. DNYANSAGAR, V. R. **Embryological studies in the Leguminosae. 1. A**

contribution to the embryology of *Leucaena glauca* Benth. *J. Indian bot. Soc.* 28 (2), 1949 (95–107). 19 refs.

12.14. Organography. Morphology. Anatomy. Histology

See also *For. Abstr.* 11 (Nos. 1623, 1650).

1654. VILLARS, R. Étude des effets produits par les rayons x, le polonium et divers agents chimiques sur les cellules méristématiques des végétaux supérieurs. [**Study of the effects produced by X-rays, polonium and various chemical agents on the meristematic cells of higher plants.**] *Rev. gén. Bot.* 56 (663–7), 1949 (205–31; 258–81; 318–32; 364–80; 404–23 + 3 plates). 101 refs. [F.] O.B.D.

Among studies of the cytological effects of X-rays and other treatments on various species is included an account of the action of X-rays and Po on the meristem of the radicle of *Pinus pinea*.

1655. GARRISON, R. **Origin and development of axillary buds: *Betula papyrifera* Marsh. and *Euptelea polyandra* Sieb. et Zucc.** *Amer. J. Bot.* 36 (5), 1949 (379–89). 22 refs. [Harvard University.] O.B.D.

1656. MACHADO, D. PEREIRA. Origem e desenvolvimento da cortiça no sobreiro. [**Origin and development of the bark in *Quercus suber*.**] *Bol. Junta nac. Cortiça, Lisboa* 11 (126–7), 1949 (268–72, 317–9, LIX). 12 refs. [Port.e.]

An anatomical study.

12.19. Geographical Distribution. Plant Geography and Sociology

1657. **The Cedars of Cyprus.** *For. Treasures* 6 (1), 1949 (14–9).

An account of *Cedrus brevifolia*, its characters and ecology, and distribution and numbers in Cyprus.

1658. [LOOCK, E. E. M.] **Tree seed hunting in Mexico.** *J. S. Afr. For. Ass.* No. 18, 1949 (56–70 + 4 photos). [E.]

Extracts from letters written by the officer sent from S. Africa to collect Pine seed of various Mexican species; they deal mainly with distribution of the species. *P. pseudostrobus* appears to bear cones only when growing in isolation.

1659. ROL, R. La répartition du charme en France. [**The distribution of Hornbeam in France.**] *Schweiz. Z. Forstw.* 100 (3/4), 1949 (160–7). [F.g.]

The distribution of *Carpinus betulus* in France, and especially its failure to reach the Mediterranean region although it exists in a large part of Greece and round the Black Sea, leads the author to the supposition that there may in fact be two forms of the species, biologically distinct though morphologically identical—a mid-European form and a Mediterranean-Pontic form. Such a distribution would be analogous to that of the European Beeches (*Fagus sylvatica* and *F. orientalis*).

1660. DARMER, G. Neue Beiträge zur Oekologie von *Hippophae rhamnoides* L. (Sanddorn). [**Fresh contributions to the ecology of *H. rhamnoides*.**] *Biol. Zbl.* 67 (7/8), 1948 (342–61). 18 refs. [G.g.russ.e.f.] E.M.B.

The results of studies made in the coastal region of the Baltic in 1942–45, and covering morphology, silvicultural requirements, ecology, pests, and vitamin content of the berries.

1661. ALBUQUERQUE, J. P. MANIQUE E. Zonas suberícolas portuguesas. [**Portuguese cork-growing zones.**] *Bol. Junta nac. Cortiça, Lisboa* 11 (122), 1948 (57–60, XVI). [Port.e.]

Defines and describes the ecological zones of Portugal and the boundaries of the habitat of *Quercus suber*, which grows in Portugal under 12 types of climatic condition. Of the three limiting factors, viz. proximity to the ocean, minimum temperatures, and aridity, only the last two are of importance in Portugal in defining the boundaries of *Q. suber*. The tree grows in an ocean climate, but does not attain its maximum development there. The best hydrothermic conditions are to be found in the climate of Ribatejo and Sado, in the north and east of Alentejo, the south east of Beira-Baixa in central Alto Douro, and in Baixo Tua. [Cf. *For. Abstr.* 11 (No. 1714).]

1662. CHAPPUIS, J. B., and RICHARD, J. L. Contribution à l'étude du tilleul. [**A contribution to the study of the Lime.**] *Schweiz. Z. Forstw.* 100 (2), 1949 (99–104). [F.]

Discusses the identification, silvicultural characters, distribution in Switzerland, and ecology of *Tilia platyphyllos* and *T. cordata*. The former requires plenty of warmth and prefers rocky sites; its moisture requirements are low, and it is well adapted to be a pioneer species on unstable or rocky slopes. *T. cordata* needs less warmth and light, but more moisture. On the level it does equally well on dry or well drained acid soils and on damp and clayey neutral soils and is well adapted for underplanting.

12.19.1. *Regional Floras, including Check Lists*

1663. EDLIN, H. L. **British woodland trees.** B. T. Batsford Ltd., London. 3rd ed. (rev.), 1949. pp. 182 + 133 photos, drawings.

The text has been revised throughout and there are several new features, e.g. Scots Gaelic and Dutch names, indications of volume and prices attained by different species, and ground-flora indicator species.

1664. BRENAN, J. P. M., and GREENWAY, P. J. **Check-lists of the forest trees and shrubs of the British Empire. No. 5. Tanganyika Territory. Part II.** Imperial Forestry Institute, Oxford. 1949. pp. xviii + 664.

Part 1 [cf. *For. Abstr.* 3 (32)] gave native names and their botanical equivalents. Part II consists of brief descriptions and ecological notes for 4,694 species.

1665. **Native trees of Canada.** *Bull. For. Serv. Can.* No. 61 (4th ed.), 1949. pp. 293. Price $1.50.

In this edition the method of presentation has been altered, drawings being replaced by photographic illustrations. Range maps are given for each species.

12.19.2-3. *Vegetation Types*

See also *For. Abstr.* 11 (Nos. 1611, 1684, 1710, 1712, 1754, 2235, 2252, 2378–80).

1666. RUBNER, K. Die Waldgesellschaften in Bayern. **[The forest associations of Bavaria.]** *Forstw. Praxis, München* No. 4 [1949]. pp. 57. 3 refs. [G.] Price DM.2.

A concise, practical guide for the beginner, describing simply the fundamental notions and methods of plant sociology, the chief natural forest associations of Bavaria, secondary forests and the communities of felled areas, and the value of plant sociological studies in silviculture. A list is given of characteristic and differential species of the associations, together with the most important soil indicators.

1667. FIRBAS, F., and LOSERT, H. Untersuchungen über die Entstehung der heutigen Waldstufen in den Sudeten. **[Investigations into the origin of the modern forest belts in the Sudetenland.]** *Planta* 36 (5/6), 1949 (478–506). Numerous refs. [G.g.] O.B.D.

1668. ROL, R. Types de hêtraies en France. **[Types of Beech wood in France.]** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (13–4). [F.]

Classifies Beech stands according to topography, soils and ground vegetation.

1669. SOCHAVA, V. B. O proiskhozhdenie bukovȳkh lesov Kavkaza. **[On the origin of the Beech [*Fagus orientalis*] forests of the Caucasus.]** *Izvest. Akad. Nauk SSSR (Ser. biol.)* 1949 (2), (224–36). 51 refs. [Russ.] [Botanicheski Institut im. V.L. Komarova.] A.C.P.

Examines the controversial question of the antiquity of these forests, on the basis of literature and the author's own studies, with particular attention to the associated species of the shrub and ground layers, distinguishing 4 main floristic types of Caucasian Beech forest. Concludes that as an ecological type these forests have developed only in Pleistocene and more recent times. A sketch map is included of the distribution in the Caucasus of the 4 types of Beech forest recognized.

1670. **Vegetation types in Tropical Africa.** *Emp. For. Rev.* 28 (3), 1949 (205–6).

A discussion was held at Oxford, in May 1949, to determine whether any, and if so what, action was desirable and possible to coordinate our knowledge of the classification of tropical vegetation types in Africa. It was decided that too rigid an emphasis on climate would be misleading, in view of the extensive biotic interference in Africa and the importance of site-modified vegetation. Physiognomy received more general acceptance, but the importance of topography and floristic composition were also emphasized. Shantz and Marbut's

classification [cf. *For. Abstr.* 11 (No. 132)] suffered from the fact that West African vegetation had received so little attention. The following recommendations were made:—(1) that a committee of 3 or 4 ecologists from different parts of Africa be appointed to draw up a simple classification based on extensive field experience. (2) That in order to facilitate agreement and uniformity among the members, all should see each other's regions. (3) That the classification prepared should be discussed with specialists such as Prof. Tansley, for criticism before adoption. (4) That the French and Belgian territories be included in the scope of the survey.

1671. KEAY, R. W. J. **An outline of Nigerian vegetation.** Government Printer, Lagos. 1949. pp. 52 + map. 98 refs.

The following are described:—(1) Mangrove forest and coastal vegetation, (2) freshwater swamp communities, (3) rain forest and dry forest zones, (4) the savanna regions (S. Guinea, N. Guinea, Sudan and Sahel), and (5) mountain vegetation. There are 12 profile diagrams. [Cf. *For. Abstr.* 10 (No. 1641).]

1672. DAYTON, W. A. **Forest types of the United States.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (109–14).

A brief historical review of ways in which forest types have been defined by ecologists since 1899, with a forest vegetation map of the U.S.A.

1673. WARE, G. H., and PENFOUND, W. T. **The vegetation of the lower levels of the floodplain of the South Canadian River in Central Oklahoma.** *Ecology* 30 (4), 1949 (478–84). 3 refs.

The sparse vegetation of the sand flats of the South Canadian River near Norman, Oklahoma, is described. The predominant woody species were Cottonwood (*Populus deltoides*), Sandbar Willow (*Salix interior*), and Salt Cedar (*Tamarix gallica*), and these were of primary importance in raising the level of the sand flats, and continued to be the dominant species on the older part of the second level.

The above species produced leaves by April 1, fruits early in May, and seedlings soon after. Seeds were found to be viable when mature, and to remain viable for 1–2 weeks only. They took longer to germinate as they aged.

The taproots of all woody plants decomposed after they entered the saturated zone of sand, but long lateral and adventitious roots were abundant in all 3 species. Only *S. interior* was observed to reproduce from suckers. Main branches of *S. interior* and *T. gallica* were killed back from the tip each winter, but recovered readily by the production of lateral branches. *From authors' summary.*

1674. OLIVEIRA, A. P., and LIMA, D. A. Serra Negra. **[Serra Negra [: a short description of the plateau and its vegetation].]** *Bol. Sec. Agric. Ind. Com., Pernambuco* 15 (3/4), 1948 (388–97). [Port.]

1675. OLIVEIRA, B. DE. As regiões de ocorrência normal da Araucária. (Ligeira contribuição para o estudo ecológico do pinho brasileiro). **[The habitat of Araucaria. (A short contribution to the study of Brazilian Pine).]** *An. bras. Econ. flor., Inst nac. Pinho* 1 (1), 1948 (185–99). 9 refs. [Port.] P.R.

Describes and discusses climate, geology, and soil conditions of the natural habitat of *Araucaria angustifolia* in Brazil.

1676. LABOURIAU, L. F. GOUVÊA, and MATTOS, A. DE. Notas preliminares sôbre a 'região da *Araucaria*'. **[Preliminary notes on the *Araucaria* region.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (215–28). [Port.] P.R.

Preliminary results of an expedition to study the stands of *Araucaria angustifolia* maintained by the Institute Nacional do Pinho. Short notes are presented on depopulation and succession in the stands, with more detailed observations on the stands at São Francisco de Paula (Rio Grande do Sul) and a discussion of relevant problems.

1677. KALELA, E. K. Über die Holzarten und die durch klimatischen Verhältnisse verursachten Holzartenwechsel in den Wäldern Ostpatagoniens. **[On the tree species and the successional changes in composition, caused by climatic conditions, in the forests of E. Patagonia.]** *Suomalaisen Tiedeakatemian Toimituksia, Helsinki (Ser.A) IV. Biologica* No. 2, 1941. pp. 151. 62 refs. [G.g.]

This work—a result of the Finnish Expedition to Patagonia in 1937–8—has chapters on:

(1) Climate. (2) Forest regions and their subdivisions. (3) The autecology, with special reference to regeneration, of the most important trees (*Nothofagus dombeyi, N. pumilio, N. antarctica, N. procera, N. obliqua, N. betuloides, Fitzroya patagonica, Libocedrus chilensis, Araucaria araucana*). (4) The westward retreat of the forests before the advancing steppe, and associated changes in the specific composition of the forests, phenomena ascribed chiefly to a deteriorating climate. (5) Suggestions on measures to retard this process, e.g. control of fire, grazing and timber exploitation, coupled with active silvicultural attention. Reforestation of devastated areas is a pressing requirement, and one of the most important questions is that of securing a suitably balanced specific composition in future forest stands, where it will be advisable to try exotics of possible value, as well as native species. [Cf. *For. Abstr.* 11 (No. 2380).]

12.2. *Special (Systematic) Botany*

12.21. Bacteria. Fungi

See also *For. Abstr.* 11 (Nos. 1601, 2262 *et seq.*).

1678. BATAILLES, F. Les réactions macrochimiques chez les champignons, suivies d'indications sur la morphologie des spores. **[The macrochemical reactions of fungi, together with indications of spore morphology.]** Société mycologique de France, 16 Rue Claude-Bernard, Paris V. 1948. pp. 171. [F.]

1679. ERIKSSON, J. **The Swedish species of the *'Poria vulgaris'*—group.** *Svensk bot. Tidskr.* 43 (1), 1949 (1–25 + 5 plates). [E.] O.B.D.

1680. BUCHWALD, N. F. **Studies in the Sclerotiniaceae. I. Taxonomy of the Sclerotiniaceae.** *Aarsskr. Vet.-Landbohøjsk.* 1949 (75–191). 8 pp. of refs. [E.e.]

12.25-9 Spermatophyta

1681. BOOM, B. K. Nederlandse dendrologie: geillustreerde handleiding bij het bepalen van de in Nederland voorkomende soorten en varieteiten der gekweekte houtgewassen. **[Netherlands dendrology: an illustrated manual for the determination of the cultivated species and varieties of woody plants in Holland.]** H. Veenman en Zonen, Wageningen. 3rd ed., 1949. pp. 444. [Du.] Price [£2. 1*s.* 0*d.*]

12.25. Gymnosperms

1682. MAGINI, E. Il riconoscimento delle piante adulte. (A) Conifere: (2) Cedri e Larici, (3) Tasso e Abeti, (4) Cipressi. **[The identification of adult trees. (A) Coniferae: (2) Cedars and Larches, (3) Yew and Firs, (4) Cypresses.]** *Ital. for. mont.* 4 (6), 1949 (375–80). [It.]

Deals with *Cedrus deodara, C. libani, C. atlantica, Larix decidua, L. leptolepis, Taxus baccata, Picea abies, Pseudotsuga taxifolia, Abies alba, A. cephalonica, Chamaecyparis lawsoniana, Cupressus arizonica, C. macrocarpa* and *C. sempervirens.*

1683. FRANCO, J. DO AMARAL. Notas sobre a nomenclatura de algumas coníferas. **[Notes on the nomenclature of some Coniferae.]** *Repr.* from *Portugaliae Acta Biológica (B)* Spec. Vol., 1949 (19–35). 16 refs. [Port.]

12.26-8 Dicotyledons

See also *For. Abstr.* 11 (Nos. 1649–51, 1662–5).

1684. RAGONESE, A. E., and CASTIGLIONI, J. A. Nueva especie del género *Schinopsis* y área geográfica de las especies argentinas. **[New species of *Schinopsis* and geographical distribution of the Argentine species.]** *Revista de Investigaciones agrícolas, Buenos Aires* 1 (2), 1947 (93–100 + 1 map + 5 drawings). 24 refs. [Span.] C.G.B.

Illustrates, by means of a map, the range of the most important species of *Schinopsis* in Argentina, lists the associated vegetation and describes *Schinopsis heterophylla*, a new species. A table showing tannin content of *S. lorentzii, S. lorentzii* var. *marginata, S. heterophylla* and *S. balansae*, and a key to the species, are included.

1685. THOMPSON, J. M. **A contribution to our knowledge of the Apocynaceae with special reference to *Pleiocarpa mutica* Benth.** *Proc. Linn. Soc., Lond.* 161 (1), (1948/9), (12–26). O.B.D.

A morphological study.

1686. PICHON, M. Le genre *Humbertia*. **[The genus *Humbertia*.]** *Phanérogamie* 13 (1/2), 1947 (13–25). 2 refs. [F.] O.B.D.

Important morphological differences prevent the inclusion of *Humbertia* among the Convolvulaceae. The author suggests that the genus belongs to a separate family to which he gives the name Humbertiaceae.

1687. HUMBERT, H. Au sujet de *Humbertia madagascariensis* Lamk. **[Note on *H. madagascariensis*.]** *Phanérogamie* 13 (4), 1948 (303). [F.] O.B.D.

A short account of the discovery of both living and dead individuals of *Humbertia madagascariensis* in Madagascar, where, however, the species is threatened with complete extinction, mainly because of fires and land clearance. Owing to the unusual durability of the wood, trunks and limbs of dead trees have remained in the forest, surviving fire and termite attack for a century or more.

1688. DUCKE, A. Novas contribuições para o conhecimento das seringueiras de Amazônia brasileira. II. **[Fresh contributions to the knowledge of *Hevea* species of Brazilian Amazonia.]** *Bol. tec. Inst. agron. Norte* No. 10, 1946. pp. 24. 2 refs. [Port.]

Notes on distribution and botanical characteristics with a list of species, varieties, forms and synonyms. [Cf. *For. Abstr.* 6 (153).]

1689. PERRIER DE LA BATHIE, [H.] Les Hypericacées de Madagascar et des Comores. **[The Hypericaceae of Madagascar and the Comoro Islands.]** *Phanérogamie* 13 (4), 1948 (268–90). [F.] O.B.D.

Distribution and morphological and taxonomic characteristics, with mention of the following new tree species: *Psorospermum nervosum*, *P. sexlineatum*, *P. atro-rufum*, *P. bullatum*.

1690. MANNING, W. E. **The genus *Alfaroa*.** *Bull. Torrey bot. Cl.* 76 (3), 1949 (196–209). 16 refs. O.B.D.

A botanical study with a tabulated comparison with some related genera and species.

1691. MANNING, W. E. **The genus *Carya* in Mexico.** *J. Arnold Arbor.* 30 (4), 1949 (425–32). [Bucknell University, Lewisburg, Penn.]

A key to the 5 Mexican species of *Carya*, with botanical notes.

1692. GAGNEPAIN, F. *Matpania* n.g. des Phytocrénacées. **[*Matpania* gen. nov. (Phytocrenaceae).]** *Phanérogamie* 13 (3), 1948 (189–90). [F.] O.B.D.

Describes *M. laotica*, a tree about 25 m. high belonging to no known genus of the Phytocrenaceae, found near Savannakhet, Laos, French Indo-China.

1693. GUTIERREZ V., G. Estudio del género *Inga* y de los barbascos colombianos. **[Study of the genus *Inga* and of toxic plants in Colombia.]** *Rev. Fac. nac. Agron., Medellín* 7 (25), 1947 (25–126). 23 refs. [Span.]

A botanical study (with key) of the genus *Inga* in Colombia and brief notes on the most important Colombian plants producing toxic substances which might be used as insecticides.

1694. KRUKOFF, B. A., and MONACHINO, J. **[Taxonomic] problems in the American species of *Strychnos*.** *Bol. tec. Inst. agron. Norte* No. 15, 1948 (35–41). 10 refs. [E.]

1695. KRUKOFF, B. A., and MONACHINO, J. **The genus *Strychnos* in Surinam.** *Darwiniana, B. Aires* 8 (4), 1949 (476–80). 9 refs. [E.] A.P.B.

1696. LEROY, J.-F. Les mûriers sauvages et cultivés. La sériciculture sous les tropiques. **[Wild and cultivated Mulberries. Sericulture in the tropics.]** *Rev. int. Bot. appl. Agr. trop.* 29 (323/4), 1949 (481–96). 39 refs. [F.] P.R.

The subdivision of the genus *Morus* into *Eumorus*, *Gomphomorus* and *Afromorus* is proposed and justified morphologically and on the basis of the anatomy of the wood. The cytology, evolution and distribution of the genus are discussed. Most species have a timber that is widely used locally and has a fairly important commercial value for joinery, turnery, sports articles, constructional timber, telegraph poles etc. The history of the use of leaves of *Morus alba* in silkworm breeding, and possible developments, are discussed.

1697. BLACK, G. A., and PIRES, J. MURÇA. Notas sôbre a flora neotrópica – I. Primeira parte. Dois gêneros novos, *Curupira* e *Froesia*, cinco espécies novas, uma nova combinação, chaves e observacões sôbre plantas de região amazônica. **[Notes on the Neotropical flora – I. First part. Two new**

genera, *Curupira* and *Froesia*, five new species, a new combination, keys and observations on plants of the Amazonian region.] *Bol. tec. Inst. agron. Norte* No. 15, 1948 (1–32 + 7 drawings). [Port.e.]

Includes descriptions of the following:— (1) *Curupira tefeensis* gen. et sp. nov., found in the region of Teffé, Amazonas. *Curupira* is of the Olacaceae, but its position in the family was not definitely ascertainable from the herbarium material available. The ripe fruits have an endosperm rich in oily substances which are used for soap-making. (2) *Froesia tricarpa* gen. et sp. nov., a shrub found in Amazonas, growing among typical caatinga vegetation.

1698. HOWARD, R. A. **The genus *Coccoloba* in Cuba.** *J. Arnold Arbor.* 30 (4), 1949 (388–424). [Harvard University.]

Discusses points of nomenclature and taxonomy and gives a key to the species with a description of the most important Cuban ones. The following new tree species are included:— *Coccoloba retirensis* and *C. leonardii*.

1699. RECHINGER, K. H. **Key to the British species of *Salix*.** *Watsonia* 1 (3), 1949 (154–62).

1700. GAGNEPAIN. F., Un genre nouveau des Staphyléacées. [**A new genus of the Staphyleaceae.**] *Phanérogamie* 13 (3), 1948 (190–1). [F.] O.B.D.

The author proposes a new genus *Triscaphis* (with a single species *T. kerrii*) formerly classed with *Staphylea*, but now believed to be distinct from this genus, though still included in the family Staphyleaceae.

1701. LEANDRI, J. Contribution a l'étude de Thyméléacées d'Indochine. [**Contribution to the study of the Thymelaeaceae of Indo-China.**] *Rev. int. Bot. appl. Agric. trop.* 29 (323/4), 1949 (497–505). 8 refs. [F.] P.R.

Gives a botanical description and notes on the distribution in Indo-China of *Aquilaria* spp., *Wikstroemia* spp., *Eriosolena composita*, *Rhamnoneuron balansae*, *Linostoma decandrum*, and *Enkleia malaccensis*, and discusses the properties and uses of the timber, bark, etc.

12.29. Monocotyledons

1702. VASCONCELLOS, J. DE CARVALHO E, and FRANCO, J. DO AMARAL. As palmeiras de Lisboa e arredores. [**The Palms of Lisbon and its surroundings.**] *Repr.* from *Portugaliae Acta Biológica* 2 (4), 1948 (289–425 + 28 photos + 41 drawings). 83 refs. [Port.]

13. FOREST ZOOLOGY

See also *For. Abstr.* 11
(Nos. 1818, 1899–1909, 2279 *et seq.*).

1703. MERTENS, R. Die Tierwelt des tropischen Regenwaldes. [**The fauna of tropical rain forest.**] Verlag von Waldemar Kramer, Frankfurt a/M. 1948. pp. 144. [G.] Price DM.8.50.

1704. STEINHAUS, E. A. **Principles of insect pathology.** McGraw-Hill Book Co., Inc., New York, Toronto, London. 1949. pp. 757. 966 refs.

1705. KNOTH, K. E. Vermehrte Pflanzenschäden, Folge örtlicher Klimaänderungen? [**Increased insect pests, are they the result of local climatic changes?**] *Anz. Schädlingsk.* 22 (10), 1949 (149–51). [G.]

Discusses the possible effects on insect populations of local climatic changes brought about through clear felling, and gives some figures to illustrate the extent of such changes.

1706. GYÖRFI, J. A világosság és a fény hatása a rovarokra. [**The effect of light on insects.**] *Erdész. Kisérl.* 48 (3/4), 1948 (108–15). 5 refs. [Hu.g.]

Artificial light is found to stimulate insects which are active by day, and to reduce the activity of night-flying moths and beetles. *Chrysobothris affinis* is active at 26° C. when in sunlight, but only at 29° C. in the absence of sunshine. *Agrilus* spp. favour trees standing in sunlight for egg-laying. Some species of beetle, particularly *Coraebus bifasciatus*, prefer tree tops. Hymenoptera are particularly dependent on sunlight for general activity and for mating and egg-laying.

1707. GYÖRFI, J. Beobachtungen über die Ernährung der Schlupfwespen. [**Notes on the feeding habits of parasitic Hymenoptera.**] *Anz. Schädlingsk.* 21 (5), 1948 (73–4). [G.]

1708. FORSTER, E. W. **On the taxonomic status of the European Spruce sawfly, *Gilpinia hercyniae* (Htg.) (Hymenoptera, Diprionidae).** *Canad. Ent.* 81 (5), 1949 (112–3). O.R.S.

Confirms the fact that *G. polytoma* and *G. hercyniae* are distinct species.

1709. Gornitz, K. Anlockversuche mit dem weiblichen Sexualduftstoff des Schwammspinners (*Lymantria dispar*) und der Nonne (*Lymantria monacha*). [**Attraction tests with the female odoriferous sex-attractant of gypsy moth and nun moth.**] *Anz. Schädlingsk.* 22 (10), 1949 (145–9). 11 refs. [G.g.]

Males of *Lymantria dispar* in captivity manifest only a comparatively slight reaction to extracts of the female odoriferous sex-attractant. In the open, extracts of sex-attractant secretions of *L. dispar* attracted more males of *L. monacha* than of *L. dispar*, while, on the other hand, extracts from *L. monacha* attracted, almost exclusively, males of the same species. No mating between the two species was observed in specimens in captivity. Extracts from *L. dispar* were still effective after 4 years' storage.

1710. Clark, L. R. **Observations on the plant communities at 'Bundemar', Trangie District, New South Wales, in relation to *Chortoicetes terminifera* (Walk.) and *Austroicetes cruciata* (Sauss.).** *Bull. Coun. sci. industr. Res. Aust.* No. 236, 1948. pp. 63 + 10 photos. 11 refs.

The vegetation in the area studied can be classified under the *Eucalyptus populifolia/Callitris glauca* association, but there is little undisturbed climax or subclimax vegetation left. Ringbarking and clearing of trees, combined with grazing, have resulted in a number of disclimax communities, in each of which a distinctive pasture type has developed. The available evidence on the structure of the original communities indicates that those possessing trees as dominants were not favourable to either of the species of Locust under consideration. One effect of clearing and grazing has been to permit the development of vegetation favourable to these Acridids, and another has been a reduction in numbers, or complete elimination, of many species of insectivorous birds, which were very numerous before the widespread destruction of nesting sites.

1711. Jameson, E. W. Jr. **Some factors influencing the local distribution and abundance of woodland small mammals in central New York.** *J. Mammal.* 30 (3), 1949 (221–35). 28 refs. O.R.S.

Aspects of the habitat responsible for interrupted distribution of certain kinds of mice and shrews in wooded areas of central New York state were found to be:—(1) exposure of the site, (2) nature of the humus, and (3) competition between species.

2. SILVICULTURE

See also *For. Abstr.* 11 (Nos. 1561, 2202, 2428).

1712. Jemison, M. G., and Hepting, G. H. **Timber stand improvement in the Southern Appalachian region.** *Misc. Publ. U.S. Dep. Agric.* No. 693, 1949. pp. 80. 58 refs.

Mainly a review of the literature. Appendices give data on cover types, tree species, diseases, and insect pests.

1713. Bolton, Lord. **The growth and treatment of Sycamore in England.** *Quart. J. For.* 43 (4), 1949 (161–7 + photos).

Sycamore [*Acer pseudoplatanus*] does best in the northern counties, particularly on fissured limestone in the gills (deep ravines) of the Pennine Range. It also does well in Devon and the Cotswolds, and there are possibilities of using it as a nurse to Sitka Spruce on high moorland sites. It is completely frost-hardy and very wind-firm. The best trees are produced from natural regeneration. Pure stands are unsatisfactory and a 1 : 5 mixture of Sycamore and Larch is recommended. If the previous crop has been pure Larch, the suggested mixture is 5 Larch, 1 Sycamore, 1 Beech, the Beech to be topped to encourage them to form an understorey. On sites which are not absolutely first-class, cutting back in the 2nd or 3rd year after planting eliminates check. The importance of pruning and thinning are emphasized. Grey squirrels and rabbits are the chief enemies of Sycamore.

1714. NATIVIDADE, J. V. Os fundamentos científicos da cultura racional do sobreiro. **[Scientific principles of the rational cultivation of *Quercus suber*.]** *Bol. Junta nac. Cortiça, Lisboa* 9 (104; 107), 1947 (381–91; 541–50); 10 (112–115, 119), 1948 (170–6; 225–31; 279–84; 331–5; 551–9); 11 (124), 1949 (167–76). [Port.]

Reviews the condition of Cork Oak (*Quercus suber*) forests in the Mediterranean with particular reference to Portugal, considers the ontogeny and natural distribution of the Cork Oak, describes the composition of stands in Portugal with that of some of the Spanish, French and North African stands, and traces the history and vicissitudes of Cork Oak forests in Portugal, Spain, Algeria, Tunisia and Morocco. The author finally discusses the disturbance by man of the biological equilibrium of the Portuguese Cork Oak stands and their consequent regression, and considers the problem of reconciling good silvicultural practices with intensive cork production methods. [Cf. *For. Abstr.* 11 (No. 1661).]

1715. MARIE, E. Notes sur les reboisements en *Swietenia macrophylla* King. **[Afforestation with *S. macrophylla*.]** *Carib. For.* 10 (3), 1949 (205–22). [F.E.Span.]

Gives instructions for the cultivation of Mahogany (*Swietenia macrophylla*) in Martinique. Plants are usually raised from seed in the nursery, but wildings 10–15 cm. tall may be brought in to the nursery towards June, at the beginning of the rainy season. After 6 months, seedlings are ready for use without nursery transplanting. In the open and in brushwood, plants are set at 3 × 3 m. spacing, lines 1·5 m. wide being opened in the brushwood at right angles to the prevailing winds. In cut-over forest land, planting is done at a spacing of 4 × 4 m., introducing food crops during the first 2 years. When cultivation stops, intermediate rows are planted each way, thus reducing the spacing to 2 × 2 m. After 25 years, on a good site, the timber is merchantable, but its maximum value is not reached until the 40th year. For exploitation between 35 and 40 years the most favourable conditions seem to be an elevation of 200–400 m., soil rich in humus, and a site not too steep, and protected from winds. Some data are given on thinning, pests, growth rates, and costs and returns from plantations.

1716. PICCAROLO, G. Expériences faites dans la culture du peuplier en Italie. **[Research on Poplar-growing in Italy.]** *C.R. Congr. int. Union For. Res. Organ., Zürich 1948*, 1949 (97–140). [F.f.e.g.] [Istituto di Sperimentazione per la Pioppicoltura, Casale Monferrato.]

Cf. *For. Abstr.* 10 (No. 1710).

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

See also *For. Abstr.* 11 (Nos. 1660–2, 1677, 1754).

1717. LITTLE, E. L. JR. **Important forest trees of the United States.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (763–814).

A list of 165 native trees giving common and scientific names, drawings, keys for identification, brief descriptive notes, distribution maps and lists of principal uses.

1718. TEMPLER, J. T. **Further notes on Mvule (*Chlorophora excelsa*).** *E. Afr. agric. J.* 15 (1), 1949 (43–4).

Notes on a plantation of *C. excelsa*, interplanted with Banana, in Kenya. The rate of height increment appears to be directly related to the extent of crown. Once canopy is formed, self-pruning occurs. [Cf. *For. Abstr.* 10 (No. 970).]

1719. DOMINIK, T. Przyczynek do znajomości wartości hodowlanych czeremchy amerykańskiej. **[Silvicultural properties of *Prunus serotina*.]** *Sylwan* 91 (1/4), 1947 (123–32). [Pol.f.]

Observation of a 20- to 25-year-old pure stand of *Prunus serotina* of poor form growing on a deep sandy soil in the Forest District of Baszkow in Western Poland, and of its natural regeneration under a nearby 45-year-old Scots Pine stand, led the writer to the following conclusions:—

(1) *Prunus serotina* regenerates freely under Scots Pine in the pole stage, and attains a height of 3 m. (2) It starts seeding at 10 years old, after which young seedlings begin to appear and form an uneven-aged constantly regenerating underwood. (3) Its litter decomposes quickly without forming an acid humus. (4) Its deep and well developed root system aerates the soil and improves its structure; it also brings alkaline compounds from the deeper soil layers and reduces the acidity of the top

soil by providing an abundant litter of base-rich leaves. (5) It provides food and cover for birds, is not browsed by game or rabbits and hence is suitable for rabbit-infested areas.

1720. ALVINO, G. E. **Alpine Bamboo forest in East Africa.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (9–10).

Silvicultural characters, reproduction, and utilization of *Arundinaria alpina.*

21.0. *Adaptability to the General Environment. Acclimatization*

See also *For. Abstr.* 11 (Nos. 1661, 1675–7, 2357–60).

1721. MADLEN, J. Pestovanie cudzokrajných drevín v našich lesoch. [**Cultivation of exotic tree species in Slovakian forests.**] *Pol'ana* 4 (3), 1948 (54–6, 71). [Slovak.]

A plea for the greater use of certain exotics based in part on the comparative growth results of the forms 'Von Kevele' and '*borealis*' of *Picea abies* as compared with the native form, and of *Larix leptolepis* as compared with *L. decidua.* Tables are given showing various components of growth for these species and forms, on small plots measured in 1922 and 1946, and comparative data for soil moisture, organic matter and litter depth in 1946. Brief notes are given on Douglas Fir and *Pinus strobus, P. ponderosa* and *P. sylvestris* and a list of exotics available from the nursery of the Institute of Silviculture and Forest Biology, Banska Štiavnica. Differences in the cones, seed and foliage of the Spruces are shown in photographs.

1722. POURTET, J. Catalogue des espèces cultivées dans l'Arboretum des Barres. II. Angiospermes. [**Catalogue of the cultivated species in the Arboretum of Les Barres. II. The Angiosperms.**] *Ann. Éc. Eaux For. Nancy* 9 (2), 1949 (235–664 + 1 map). [F.]

The general lines of this fascicle follow those of the earlier fascicle on conifers [cf. *For. Abstr.* 8 (No. 171)], but species of arboricultural and of silvicultural interest are distinguished by the use of a different type.

1723. PONTE, B. DA. Le pin sylvestre dans la Calabre. [***Pinus sylvestris* in Calabria.**] *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (35). [F.]

1724. ROVSKI, V. M. Pekan v Sredney Azii. [**The Pecan in Central Asia.**] *Priroda, Moskva* 38 (6), 1949 (61–2). 5 refs. [Russ.] A.C.P.

Reviews a number of trials of Pecan (*Carya pecan*), of interest both for its nuts and its wood, in Central Asia (Uzbekistan, Tadzhikistan and Turkmenistan) by VNIISS [All-Union Research Institute for the Dry Subtropics], the Academy of Sciences of the U.S.S.R., and the Uzbekistan Research Institute. The species was first introduced along the Black Sea coast in 1901. Besides this stock, 12 varieties have since been introduced from America.

The trials have shown that even in the drier regions Pecan grows well if given artificial irrigation and good tending. It grows excellently, reaching 5 m. in height and 12 cm. d.b.h. at 10 years of age under these conditions in Uzbekistan.

It has successfully withstood the summer heat, and severe winter frost (– 27 to – 30° C).

1725. [**Exotic Pines in N. Rhodesia.**] *Rep. For. Dep. N. Rhod. 1948*, 1949 (8).

A review was made of test plantings made at Ndola (lat. 13°, altitude 4,000 ft.) since 1933 [cf. *For. Abstr.* 2 (pp. 170–1)]. The fastest growing Pines are *P. patula, P. leiophylla, P. insularis, P. pseudostrobus, P. khasya* and *P. montezumae.* These may average as much as 5 ft. of height growth a year. Rather slower (possibly owing to a poor strain) are *P. taeda, P. caribaea, P. longifolia* and *P. engelmanni.* Definitely slow growers are *P. palustris, P. arizonica* and *P. echinata.* More or less complete failures are *P. ponderosa, P. pinaster, P. radiata, P. canariensis, P. halepensis, P. pinea* and *P. muricata.*

1726. [**Natural regeneration of exotics in Southern Rhodesia.**] *Rep. Div. For. S. Rhod. 1948*, 1949 (5, 9).

Natural regeneration of *Albizzia gummifera* was fairly general, and that of *A. moluccana* was notable for its rapid growth. *Pinus patula* germinates very heavily when the canopy is broken, and preliminary observations have been made on the effect of different light intensities on seedling survival. *Cupressus lusitanica* and *C. torulosa* have regenerated in various parts of Stapleford district, and at one place the reproduction has reached the thicket stage. *Acacia decurrens* var. *mollissima* continues to

spring up wherever it can, and *Jacaranda mimosaefolia* is regenerating in various places. *Eucalyptus citriodora* has grown naturally from seed in one native reserve. *Callitris calcarata* regenerates naturally, and some of the oldest reproduction is now 6–10 ft. high.

1727. LITTLE, E. L. JR. **Fifty trees from foreign lands.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (815–32).

Illustrated descriptions of 50 trees introduced into the U.S.A., with a list of common and scientific names and a map showing regions suitable for their cultivation.

1728. LORENZ, R. W. **Ponderosa Pine seed source study.** *For. Note Ill. agric. Exp. Sta.* No. 4, 1949. pp. 2 + 1 tbl.

Indications are that Ponderosa Pine planted in central and northern Illinois will produce Christmas trees, serve as cover to game, and produce posts. It is too soon to determine whether any one seed source is markedly superior.

1729. GYSEL, L. W. **The survival and growth of hybrid Poplars in four Michigan test areas.** *Quart. Bull. Mich. agric. Exp. Sta.* 32 (1), 1949 (156–65).

Test plantings of 8 Poplar hybrids were made in 1942 in 4 areas with distinctly different site conditions, and on each site several different combinations of soil preparation and subsequent cultivation were tested. Best survival on all plots was obtained with *P. nigra* L. × *P. laurifolia* Ledeb. It was found that an average of 60% of the stems surviving after 6 years were original; the remainder were sprouts. The average height and diameter of the hybrids were low except on one plot which had been ploughed and prepared before planting, where average height of all hybrids at 6 years old was 19 ft., and d.b.h. 2·5 in. Some of the factors affecting growth and survival were borers, canker, climate and soil. The hybrids that showed best growth on the above-mentioned plot were *P. maximowiczii* Henry × *P. berolinensis* and *P. canadensis erecta* (Selys-Longchamps) Rehd.

1730. MARTINEZ CROVETTO, R. La naturalización de *Acacia melanoxylon* en Balcarce (provincia de Buenos Aires). **[The naturalization of *A. melanoxylon* in Balcarce (Buenos Aires province).]** *Revista de Investigaciones agrícolas, Buenos Aires* 1 (2), 1947 (101–2 + 2 photos). [Span.] C.G.B.

A brief note on natural regeneration of *Acacia melanoxylon* in the district of Balcarce, where a few individuals, growing in partially quarried granite rocks, have reproduced vigorously, largely by means of root-suckering. The author believes that this species would be useful for afforestation in the mountain areas of this district.

21.1. *Light and Temperature Requirements*

See also *For. Abstr.* 11 (No. 1726).

1731. TRYON, E. H. **Color comparison of leaves of open and shade grown Holly.** *Castanea* 14 (3), 1949 (117–26).

A study was undertaken at the West Virginia Agricultural Experiment Station to determine how natural canopies of varying density affect the colour of Holly (*Ilex opaca*) leaves. Although Holly under a natural stand, allowing a penetration of 20% or less of sunlight, had greener leaves than Holly growing in the open or under a light shade, it was often spindly and of slow growth. The latter types of site are considered most favourable for growing Holly for the West Virginia market.

1732. BARNEY, C. W. **The effect of light intensity on the root growth of Loblolly Pine.** *Abstr.* in *J. Elisha Mitchell sci. Soc.* 63, 1947 (100). L.S.

Three-month-old *Pinus taeda* seedlings were grown under different intensities of artificial light and in complete darkness. Average daily root growth increased with light intensity above 290 foot candles. Lateral roots were formed and dormant roots commenced growth at 991 foot candles. A lag of about 2 days occurs between change of light intensity and its effect on root growth.

1733. SHCHEPOT'EV, F. L. Vliyanie kratkovremmenogo deystviya korotkogo dnya na rost i razvitie obȳknovennogo duba (*Quercus robur* L.). **[Influence of short-term, short-day treatments on the growth and development of Pedunculate Oak.]** *Dokl. Akad. Nauk SSSR* 56 (4), 1947 (429–31). [Russ.] [Ukrainski Nauchno-issledovatel'ski Institut Agrolesomelioratsii i Lesnogo Khozyaystva, Kharkov.] A.P.B.

Gives an account of the author's hitherto unpublished work near Kharkov in 1939[–40]. Oak seedlings which had germinated at the end of May were given short-day treatments, starting on June 2, in 30 variants (9–16 plants each) involving photoperiods of 3–12 hr. and treatments for 5, 10 and 15 days. Records of growth were made in June and August of the same year, and of leaf-fall and height in September.

The results, which are tabulated, showed that short-day treatments gave increased energy of growth and a hastening of development. The second phase of shoot growth, in June, began earlier and lasted longer than in controls; but the third phase of shoot growth, in August, was lacking in many of the treated plants, since they completed their vegetative period earlier than the controls. In 40–90% of plants given 15-day treatments with photoperiods of less than 8 hr., autumn yellowing had occurred at a time when only 3% of the controls had turned colour. Height growth of plants given 5- and 10-day periods of short days exceeded that of controls. The earlier entry into dormancy of the treated plants may be of importance in lengthening the period during which autumn planting can be done.

Further observations made in the second year of growth showed that there were statistically significant increases of number of lateral shoots and leaves in plants given 8-hr. photoperiods for 5, 10 and 15 days, and that, except for those treated for 15 days, these treatments gave a higher % of plants showing a second growth phase in the season, than did the controls. [Cf. *For. Abstr.* 10 (No. 2533).]

21.2. *Moisture Requirements. Water Régime*

See *For. Abstr.* 11 (Nos. 1623, 1786–7).

21.3. *Soil Requirements*

See also *For. Abstr.* 11 (Nos. 1593, 1596, 1647).

1734. McVickar, J. S. **Composition of White Oak [*Quercus alba*] leaves in Illinois as influenced by soil type and soil composition.** *Soil Sci.* 68 (4), 1949 (317–28). 10 refs. [Illinois Agricultural Experiment Station.]

Leaves from trees on various soil types were collected and analysed. Seasonal variations were observed, and the results of analyses were compared with data from studies of the physical and chemical properties of the soils. The % of Ca in the leaf increased as the season advanced, whereas K, P and N concentration decreased. Mg content remained fairly constant. Some evidence was obtained of the influence of soil type on the chemical composition of the leaf, but this was only significant when the poorest soils were compared to the best. No significant correlations were observed between the K, P, Mg and Ca contents or the Ca/Mg ratio of the leaves and the corresponding values for the A horizons. It is concluded that the roots can forage for the essential mineral nutrients to such an extent that they can take up amounts adequate for leaf growth even in soils comparatively low in replaceable bases. Other environmental factors expressed by the soil type, and possibly some not so expressed, apparently influence leaf composition. [Cf. *For. Abstr.* 9 (No. 1446).] *From author's summary.*

21.6. *Behaviour in the Stand. Growth Form. Habit. Tree Classes*

See also *For. Abstr.* 11 (Nos. 1646, 2346).

1735. Pozdnyakov, L. K. O differentsiatsii stvolov v drevostoyakh daurskoy listvennitsy. **[Stem differentiation in stands of Dahurian Larch.]** *Dokl. Akad. Nauk SSSR* 65 (5), 1949 (765–8). 4 refs. [Russ.] A.C.P.

Gives results from a study of the progressive differentiation with increasing age (*ca.* 60–200 years, in 20-year classes) of Kraft tree classes in pure stands of *Larix dahurica* in the basin of the Yana river. The data represent 24 sample plots laid out in similar stands of different ages, in two groups of forest types: (*a*) Larch stands of the lichen types, quality-class V*a*; and (*b*) Larch stands of the *Vaccinium vitis-idaea* types, quality-class IV.

(1) Stand constitution by tree classes changed in the period 60–200 years in the following manner:—The % of trees of Kraft classes I–III increased from 29 to 70% in (*a*) and from 38 to 82% in (*b*). Changes in the representation of Class I trees were slight—from 4 to 5% in (*a*) and 7 to 12% in (*b*). Class II trees, however, increased from 8% in (*a*)

and 14% in (*b*) to, respectively, 32% and 34%; while those of Class III increased respectively from 17% (in both cases) to 33 and 36% over the period. Trees of Classes IV and V show corresponding decreases. The distribution of tree classes thus differed with age of stand and forest type.

(2) Data for the % distribution of stem volume by Kraft tree classes and age are also tabulated. At *ca.* 60 years trees of classes I–III make up 62% (I 16%, II 24%, and III 22%) of total stem volume in (*a*) and 61% (I 17%, II 29% and III 15%) in (*b*), whereas at 200 years the corresponding figures are 91% (I 12%, II 48% and III 31%) and 95% (I 20%, II 46% and III 29%).

(3) The ratios of the mean diameters of each Kraft tree class to the mean diameter for the whole stand show a tendency, most marked in Class I and least in Classes IV–V, to decrease with age in both forest types.

(4) The mean tree of 60-year-old stands is of Kraft Class IV, whereas at 200 years it is intermediate between classes III and II.

21.8. *Phenology*

See also *For. Abstr.* 11 (Nos. 1673, 1733, 1851–3).

1736. La floración de las plantas y el tiempo en la ciudad de Buenos Aires durante el segundo semestre del año 1948. **[The flowering of plants and the weather in Buenos Aires city during the second half of 1948.]** *Bol. fenol. Dep. Met. agric., Argent.* No. 3, 1949 ([8]). [Span.]

These are charts which are published regularly in this Bulletin at half-yearly intervals.

1737. La brotación de las plantas y el tiempo en la ciudad de Buenos Aires durante el segundo semestre del año 1948. **[Leafing of plants and the weather in Buenos Aires city in the second half of 1948.]** *Bol. fenol. Dep. Met. agric., Argent.* No. 3, 1949 ([7]). [Span.]

These are charts which are published regularly in this Bulletin at half-yearly intervals.

1738. **[Gregarious flowering in N. Rhodesia.]** *Rep. For. Dep. N. Rhod. 1948*, 1949 (7).

There was a general flowering of *Pterocarpus stevensonii* throughout the *Baikiaea plurijuga* forests in 1948, a phenomenon which occurs only at long intervals. There was also a general flowering of *Baikiaea*, which happens about once in 4 years. *Oxytenanthera* Bamboo flowered along the Congo border. It is possible that these flowerings resulted from the stimulus of an exceptionally heavy rainy season followed by a mild winter and then by an unusually severe drought at the time when the rains were due again.

22. SILVICULTURAL SYSTEMS.

FORMS OF STAND

1739. SCHAEFFER, L. Les règles d'assiette des coupes. **[Rules for the form and arrangement of coupes.]** *Rev. for. franç.* No. 8, 1949 (378–85). [F.]

Briefly reviews the accepted rules for laying out felling areas, and discusses several types of felling 'key'.

1740. THOMSON, C. C. **Silviculture and cutting methods in the Maritime Provinces.** *For. Chron.* 25 (3), 1949 (191–5).

22.1. *High Forest Forms*

1741. MACBEAN, A. P. **Silviculture and cutting methods in British Columbia.** *For. Chron.* 25 (3), 1949 (164–9). 15 refs.

A review of the cutting systems and logging methods used (*a*) on the Coast, (*b*) in the Interior, and their effect on regeneration of Douglas Fir, Hemlock, Sitka Spruce, and Ponderosa Pine.

1742. ILMURZYNSKI, E. **Jardinage cutting in Poland.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (13–4).

Polish forests formerly managed on a clear-cutting system were devastated during the war, and the task of restocking the depleted stands and reconstituting the forests is being carried out by application of the selection system.

1743. DANNECKER, K. Um das Plenterprinzip in Sudwestdeutschland. **[The selection system in S.W. Germany.]** *Schweiz. Z. Forstw.* 100 (9), 1949 (414–29). [G.f.]

The author has for 25 years managed private forests of Silver Fir in Württemberg on a strict selection system, which he considers essential

to obtain the health, regeneration, and high yield of this species in S.W. Germany. Growing stock varies from 250 to 450 cu.m./ha.

22.2. *Coppice Forest*

See also *For. Abstr.* 11 (Nos. 1746–7, 1761).

1744. WATERER, R. R. **Sylvicultural systems.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (11–2).

Broadleaved coppice forest in Cyprus may be pure or form an understorey to the coniferous high forest. In either case it forms a dense and effective soil cover and is worked on selection with a diameter limit. Experiments are, however, being carried out to ascertain whether it might not be permissible and desirable to clear-fell coppice hill forest, since clear felling produces better quality and more rapid regrowth. In the lowland plantations, where protection of the site from soil erosion is not so important, it is the practice to clear-fell compartments of *Acacia* and *Eucalyptus*. This system has been found to promote the best regrowth from the coppice stools of these species, and regrowth is sufficiently rapid to allow of its being safely applied even on sand dunes.

22.6. *Changes of Silvicultural System*

See also *For. Abstr.* 11 (Nos. 1748–50).

1745. ROTH, C. Die Umwandlung nicht standortsgemässer Nadelwaldungen im Aargau. **[The conversion of coniferous stands unsuited to their sites, in the canton of Aargau.]** *Schweiz. Z. Forstw.* 100 (6), 1949 (253–82). [G.f.]

The author first discusses the federal decree of December 20, 1946, and gives an historical account of the circumstances which led to the introduction of pure coniferous stands in Switzerland. The present policy of converting such stands, when they occur on brown earths, to the natural vegetation of Oak with Hornbeam, must be carried out with due regard to ecological considerations [cf. *For. Abstr.* 10 (No. 171)]. The second part of the article describes the stands which need conversion in Aargau: 2,740 ha. should be converted in the first 20 years, and a further 3,520 in the second 20 years, while another 5,200 ha. may be converted later on.

1746. GUINAUDEAU, J. Un exemple de traitement du chêne rouvre dans le centre de la France: la forêt domaniale de Montargis. **[An example of the management of *Quercus sessiliflora* in central France: the state forest of Montargis.]** *Schweiz. Z. Forstw.* 100 (1), 1949 (12–27). [F.g.]

Describes the conversion of Oak coppice to high forest, and the liberation cuttings and successive thinnings carried out every 5 or 6 years, in such a way as to reduce competition and yet maintain an understorey of Beech and Hornbeam.

1747. ANTONIOTTI, G. B. Osservazioni pratiche sul ritorno al governo ceduo delle cerrete avviate ad alto fusto. **[Practical notes on the conversion back to coppice management, of *Quercus cerris* stands which have been treated as high forest.]** *Ital. for. mont.* 4 (5), 1949 (314–5 + 2 photos). [It.]

23. FORMATION OF STANDS

1748. Le passage de la forêt vierge à la forêt aménagée. **[Conversion of virgin forest to managed forest.]** *Proc. World For. Congr.* No. 2, 1949 (76–92). [F.e.]

This FAO report first analyses the various types of virgin forest, classifying them as either uniform or selection types, but with many intermediate forms. The importance of integrating conversion operations with industry, and the difficulty at first of eliminating fluctuations in yield, are discussed.

1749. SOUZA, P. F. **Development and silviculture of tropical virgin forests.** *Proc. World For. Congr.* No. 1, 1949 (5–13). [E.f.]

Mainly an account of the recommendations of forestry conferences, from the 1st international congress of 1926 to the Latin-American conference at Teresopolis, April 1948.

1750. SEWANDANO, R. Développement et traitement sylvicultural des forêts vierges dans les tropiques. **[The development and silvicultural treatment of virgin forests in the tropics.]** *Abstr. in Bull. World For. Congr.* No. 4, 1949 (11–2). [F.]

Mainly an account of Javanese forests. The virgin forest which still exists on the high

mountains is managed on a selection system, taking care that openings shall not exceed 0·1 ha. in extent.

1751. W[YATT]-S[MITH], J. **Survival of seedlings of Meranti Sarang Punai (*Shorea parvifolia* Dyer) and Kempas (*Koompassia malaccensis* Benth.) in *belukar*.** *Malay. Forester* 12 (3), 1949 (144–8). [Cf. *For. Abstr.* 11 (No. 2252).]

From the results so far obtained, it is indicated that seedlings of both species from isolated seedbearers can establish themselves without aid in growing young *belukar* (secondary jungle).

1752. B[ARNARD], R. C. **Planting after clear felling and burning.** *Malay. Forester* 12 (3), 1949 (142–3).

An area of typical secondary jungle with a heavy invasion of *Gleichenia* sp. and *Eugeissona triste* was clear felled in March 1947 and burnt 5 weeks later. A week after the burn, it was planted. The main experiment was with 4 types of 3-month-old *Dryobalanops aromatica* stock—(*A*) stripped seedlings, (*B*) seedlings in bamboo pots, (*C*) seedlings with leaves intact, and (*D*) topped seedlings, with a control in an adjoining unburnt area where *Gleichenia* and *E. triste* had been cut. In the unburnt area, survival after one year was similar for all treatments, but there was an appreciable mortality in the second year among (*C*) and (*D*), for which lack of adequate light was probably responsible. In the burnt block, (*A*), (*C*) and (*D*) were almost complete failures, and only (*B*) succeeded (62% survival). Height growth was almost negligible in the unburnt block in the 1st year but improved in the 2nd, though the plants were thin and spindly. In the burnt area, the plants are well developed, with strong stems, and height growth has been good. Line cleanings were carried out after 3, 6, 12, and 24 months, and a girdling carried out in the unburnt block at 24 months. The results indicate that full light and frequent cleaning in the first year result in rapid growth and early establishment, after which little tending should be required.

1753. DAWKINS, H. C. **Timber planting in the *Terminalia* woodland of Northern Uganda.** *Emp. For. Rev.* 28 (3), 1949 (226–47 + 16 photos). 7 refs.

Mvule (*Chlorophora excelsa*) is being planted in Lango and Acholi Districts to replace the heavy cut elsewhere in Uganda where conditions may not be suitable for regeneration. It is being underplanted, together with other nurse and timber species, in *Terminalia* woodland. This woodland is a stage in a sere of which Mvule is a natural, though later, member: a sere which results in the development of closed high forest from open cultivated land. The Mvule is raised in permanent rotational nurseries, and is planted out as 1 : 2 striplings. It maintains a rate of growth of about 2 ft./year in the first 10 years, falling to about 1 ft. 3 in. at 15 years, when the rate appears to be steady. The scheme aims at producing a Mvule crop of timber size, mixed with other species, in a rotation provisionally estimated at 100 years. Details are given of nursery and planting methods. Particular emphasis is laid on the ecology of the plantations and of the vegetation in which they are being established.

23.1. *Natural Regeneration*

See also *For. Abstr.* 11 (No. 1766).

1754. KALELA, E. K. **Ecological groups of tree species and silviculture.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (15–7).

Explains the value of ecological data to the silviculturist, e.g. the different treatment required to obtain regeneration of pioneer and climax species respectively.

1755. WATERER, R. R. **Natural regeneration.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (12).

Pinus halepensis var. *brutia* is a prolific seedbearer, but natural regeneration under the parent crop is very slow as it is a strong light demander. In order to obtain good regeneration, it seems that the canopy must be opened more than is prudent from a protective point of view. Experiments are being made to find a means of adjusting this difficulty. With *P. nigra* also, regeneration is very slow, in this case because of irregular and insufficient production of fertile seed. This species is a shade-bearer and regenerates best under a moderate crown canopy; it is very difficult to establish on areas that do not provide top and side shade. The indigenous Cedar, *Cedrus brevifolia*, is a light-demander that cannot

regenerate easily in competition with other species and produces insufficient seed. Local silviculture is modified to favour Cedar whereever that is required. *Cupressus sempervirens* is very slow to establish itself on cleared areas, but is a prolific seedbearer and regenerates well under the light shade cover of Aleppo Pine. With the exception of *Platanus orientalis* and *Alnus orientalis*, which regenerate freely in valley bottoms and moist places, broadleaved species regenerate very slowly.

1756. Banks, W. G., and Rettie, J. C. **Restocking conditions on the burned-over forest lands of Southwestern Maine, June 1949.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 30, 1949. pp. 9.

Of the 130,000 acres of forest land burned over in 1947, 34% appear to be adequately stocked with desirable species and another 22% appears to have sufficient sources of seed or has an adequate stand of poles and sawtimber left after the fire. The remaining 44% has no adequate seed source, and cannot be expected to regenerate naturally (at least, not with desirable species) within a reasonable period. Details are given of species composition of seedling stands.

1757. Multamäki, S. E. **On the regeneration and raising of Spruce and Birch forests on drained peat soils in Finland.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (18–20).

The natural succession on open or clear-cut peat in Finland is Birch, Birch/Spruce, pure Spruce, and since Spruce is sensitive to frost, it is advisable to aim at this succession in forestry operations [cf. *For. Abstr.* 8 (No. 2695)]. The method which has been worked out is as follows:—Forest growing on peat soils is clear felled, and drainage ditches are then dug across the area. Mild burning may sometimes be done. An area thus prepared will usually become naturally stocked with Birch seedlings, but if seed trees are lacking it is sown broadcast. Spruce usually appears simultaneously or a little later, and it too can be sown broadcast if seed trees are lacking. The Birch soon forms a thicket, in the shelter of which the Spruce grows up, and which is manipulated by thinnings to produce the kind of stand desired—Birch/Spruce or pure Spruce. The area must be protected from cattle.

1758. Crossley, D. I. **Reproduction of White Spruce in a mixedwood stand following mechanical disturbance of the forest floor.** *Silv. Res. Note For. Serv. Can* No. 90, 1949. pp. 24. 4 refs.

In 1946, on the Kananaskis Forest Experiment Station, an experiment was carried out to determine the effect of mechanical disturbance of the forest floor under a mixed stand of Poplar, Spruce (*Picea glauca*) and Douglas Fir, with a view to conversion to a wholly coniferous stand. Surface soil scarification by tractor with a bulldozer attachment, resulted in a pronounced increase in the germination of Spruce seed over that obtained on the untreated area (653 per quadrat compared with 209), reduced mortality at the end of the 2nd growing season (39·7% compared with 71·3%), and greater vigour. Despite the proximity of Douglas Fir seed trees in full fruit, only one seedling appeared on 3 quadrats, and it succumbed during the 2nd season. There was no Poplar regeneration. Observations to determine the future development of the reproduction on both treated plots and controls will continue.

1759. Hedemann-Gade, E.; Ekstrand, S. Nyheter från markberedningsfront. **[New implements for soil scarification.]** *Skogen* 36 (19), 1949 (252–3). [Sw.]

Brief notes, with photos, on an improved model of Berg's tractor-drawn scarifier [cf. *For. Abstr.* 11 (No. 232)], the Wille 'scarifying plough' (mounted on a Lenna trolley), O. Imset's forest harrow, and a hexagonal, spiked, rotating drum invented by E. Andersson.

1760. Urquhart, B. **Natural regeration.** *Scot. For.* 3 (4), 1949 (8–12).

Describes operations in an area of 6 acres of Beech wood in Scotland, *ca.* 162 years old, with some 62 stems/acre. After fencing in 1946, a heavy thinning was done, leaving 30 of the best stems per acre, the aim being to establish a natural crop of Beech, mainly as a soil-improving understorey, and to fill up with a mixture of conifers. Trunks and limbs were cross-cut in the wood and removed on trailers of pneumatic-wheeled tractors, largely for sale locally as firewood. Most of the tops went for use as foundations for corn stacks. One year later, 29% of the area was populated by Beech seedlings, and by the end of the 2nd year,

43·5%. Seedlings of Larch, Ash, and Sycamore were also observed, and a mass of willowherb had begun to colonize the more open spaces. The Beech do not appear to be suffering from competition of the willowherb and no weeding has been done. So far the cost of fencing, supervision, and overheads has been £11. 10*s.* 0*d.*/acre, and returns from sale of timber £16/acre. It is too early to assess the economics of this project, but the clearance of poor-quality stems and fencing have established the nucleus of a Beech crop. A Government grant will be available for restocking when complete, but it is expected that this may be absorbed in planting conifers at 200 plants/acre, and in weeding etc.

1761. LEMPS, F. DE. À propos de la régénération du chêne dans les taillis sous futaie de la vallée de la Saône. [**Regeneration of Oak in coppice with standards in the Saône valley.**] *Rev. for. franç.* No. 7, 1949 (314–23). [F.]

The author briefly discusses the various reasons that have been suggested for the regression of Oak in the large areas of coppice with standards in France. His own opinion is that by far the most important factor has been the method of marking standards, which has gradually depleted the Oak stools while giving no opportunity for the Oak to regenerate by seed. The consequence has been the continuous encroachment of Alder, Hornbeam and Lime. The difficulty of obtaining Oak regeneration is increased in the Saône valley by the fact that mast years occur only every 10 years or so. A method has now been developed that has met with considerable success. The essential requirement is light, and as soon as a mast year occurs, 'supplementary regeneration fellings' are made in those compartments of a felling series that have been coppiced during the previous 5 years. About one-sixth of the area of a compartment is cleared in this way in patches of not less than 15–20 ares. On very flat, wet sites, openings should not exceed 1 ha. Openings should be distributed evenly over the compartment, and release cuttings must be carried out as soon as seedlings have appeared. These release cuttings must be severe, concentrated, and repeated, so as to favour the Oak reproduction against stool shoots and suckers. They must be made at least once a year for 5–10 years, until the regeneration is definitely established. Figures are given for the cost in francs and man-days, and the methods of carrying out the whole process are discussed. Where Oak has regressed so far that there are no seedbearers, planting is resorted to, but with the same necessity for frequent release cuttings.

1762. HOLLEY, J. H., JR. **Growing Wattle.** *J. S. Afr. For. Ass.* No. 18, 1949 (20–4 + 1 photo). [E.]

The traditional method of regenerating Wattle plantations in Natal is clear felling followed by burning, direct sowing, and repeated hoeing to keep down weeds. This meant a very heavy labour bill. The writer and his father have for some time omitted to burn the felling site and have left the slash to decay on the ground, thereby obtaining profuse natural regeneration. Various methods of tending this are now being tried out:—(1) clean hoeing of weeds and all seedlings other than those retained for the future crop; (2) hoeing only along the lines of trees to be kept; and (3) no hoeing at all except to thin out trees. Method (1) showed some advantage in vigour at first, but by the end of 2 years no difference could be detected between the three treatments, which are now being applied experimentally to the complete cutting series. The most troublesome weeds, particularly watergrass, are disappearing over large areas under the new treatments, and it is concluded that this is because forest conditions have been created in the soils. These changes have effected a cut of about ⅔ in man-days required for re-establishment and seem also to have reduced insect attack. Yields are about doubled.

23.2. *Artificial Regeneration*

See also *For. Abstr.* 11 (Nos. 1759, 1794).

1763. GUINOT, R. Plantations et reboisement. [**Planting and reforestation.**] Editions de Montsouris, Paris. [1945]. pp. 144 + 15 drawings. [F.]

A manual for landowners intending to establish new plantations, or re-stock devastated woodland.

1764. [**Artificial regeneration.**] *For. Res. India Burma 1946–7*, [1949?] (11–5).

Field experiments with branch cuttings of *Dalbergia latifolia* gave 10% success with cuttings 1 ft. long and 0·6–1·0 in. in diameter,

the average height of shoot at the end of the first growing season being 10 in. Stump planting turned out to be the best method for *Anogeissus pendula*, *Hovenia dulcis* (both under shade and in the open), *Markhamia platycalyx* and *Terminalia tomentosa*. Direct sowing gave almost equally good results for *T. tomentosa*.

23.21. Choice of Species

See also *For. Abstr.* 11 (No. 2391).

1765. LEIBUNDGUT, H. Considérations biologiques sur le choix des essences. **[Biological considerations in the choice of species.]** *Additional Paper World For. Congr.* No. 2, 1949. pp. 3. [F.]

23.23. Seed and Sowings

See also *For. Abstr.* 11 (No. 1757).

23.23.1. *Seed Procurement, Treatment, and Testing*

See also *For. Abstr.* 11 (Nos. 1658, 2198).

1766. POMEROY, K. B. **Loblolly Pine seed trees: selection, fruitfulness, and mortality.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 5, 1949. pp. 17. 17 refs.

Results of several studies in Virginia and N. Carolina indicate that prolific Loblolly Pine trees can be selected by observing the following rules:—(1) Look for trees with a record of high seed production as indicated by the presence of at least 50 old or 50 ripe cones in the crown. (2) If the preceding 2–3 years have been poor seed years, reserve the largest trees among those having some cones, because prolific trees bear a few cones every year. Trees of 11 in. d.b.h. or under cannot be depended on as good seed trees.

One average and 5 good seed crops occurred in a 13-year period. The longest period between good crops was 4 years. Most Loblolly Pine seeds are dispersed in November and December, and winter logging of critical areas may result in a good seedling stand, because all the seeds produced by the stand prior to cutting are available. Some seed may be carried in the direction of prevailing winds for more than 300 ft., but 200-ft. cleared strips are recommended as the maximum. In the Bigwoods Experimental Forest, satisfactory seedling stands have been secured by alternating cleared 200-ft. strips with uncut 66-ft. strips. All strips run at right angles to the prevailing winds.

The net volume of seed trees has been known to double within 17 years. This rate of growth, if made by four 14-in. seed trees per acre, will defray carrying charges on cut-over land until a new stand is established. *From author's summary.*

1767. CSAJA, D. Nyárcsemeték nevelése. **[The raising of Poplar from seed.]** *Erdész. Lap.* 84 (2/3), 1948 (100–4). [Hu.g.f.e.]

Describes how Poplar seeds can be cleaned from fluff etc. by making minor adaptations to the ordinary local (glass) butter churn. The bottom of the churn is blocked off at a height of 1 cm. by placing in the centre of the bottom a block of wood 3 × 3 cm. and fixing on to this with drawing pins a piece of strong cardboard, cut to fit the churn but having its corners rounded off so as to leave spaces of 2 to 3 mm. between them and the corners of the churn. The churn is then loosely filled with the fluff containing the seed, and is turned until the seed is driven centrifugally down into the space below the cardboard. The seed is removed as the space becomes full, and then has to be cleaned of capsules and sand.

1768. TYSZKIEWICZ, S., and TOMANEK, J. Tablice psychrometryczne do użytku w wyłuszczarniach nasion sosny i świerka. **[Psychrometric tables for use in extraction kilns for Scots Pine and Norway Spruce seed.]** *Wydaw. pomocn. tech.-gosp. Inst. Bad. Leśn.* No. 9, 1946. pp. 20. [Pol.]

Numerous observations led the authors to the conclusion that, contrary to general belief, the germination capacity of seed is affected not only by temperatures exceeding 45–60° C. applied for their extraction, but also by high air humidity. This humidity should not be more than that corresponding to a vapour pressure of 40 mm. (mercury) in the air, at any kiln temperature worked with. For controlling air humidity in the kiln a psychrometric table has been prepared which gives the vapour pressure in mm., and the relative humidity, at temperatures between 20 and 70° C. for dry bulb, and 20 to 59° C. for wet bulb. The formulae on which the table is based are also given.

1769. **[Viability of *Hagenia anthelmintica* seed.]** *Rep. For. Dep. Tanganyika 1947*, 1949 (10).

Indications are that, given proper conditions, seed of this species remains viable for over a year.

1770. **Study of direct seeding with germinated White Pine seeds.** *Rep. Nth. Rocky Mt. For. Range Exp. Sta. 1948*, 1949 (34).

Comparative sowings, both screened and unscreened, were made with (1) cracked, stratified, germinated seeds, and (2) uncracked, stratified, ungerminated seed of *P. strobus*, to determine if (1) would prove less attractive to rodents. Results showed no significant difference between (1) and (2).

1771. **[Rodent-repellent treatment of Douglas Fir seed.]** *Rep. B.C. For. Serv. 1948*, 1949 (22–3).

[For a previous report on this project, see *For. Abstr.* 10 (No. 1772).] Of the 41 organic and inorganic treatments to repel the deer mouse (*Peromyscus*), only one as yet gives some evidence of being effective, but the results are not yet conclusive and further tests are being carried out. This treatment is mink castor, which is embodied with the seed in a pellet. Pelleting appears to be the best method of combining seed and repellent in such a way that the repellent's strength remains constant. Some preliminary work was carried out with seed-pelleting. The ingredients used are kaolin, sodium carboxy methyl cellulose, fly ash, and collodion flexile, and germination has been obtained from seed pelleted with these materials. Field and laboratory studies of mice showed that they find the seed by their sense of smell, which is highly developed. It was found that the average consumption of Douglas Fir seed by 5 mice kept on a 7-day feeding test was 217. Some notes are also given on seasonal fluctuation in mouse population.

1772. Método para acelerar la germinación de algunas semillas forestales. **[A method of accelerating germination in some forest seeds.]** *Boletín de Información del Ministerio de Agricultura, Madrid* 2 (8), 1949 (20). [Span.]

Describes successful results of treating forest seeds (*Acacia* spp., *Ceratonia siliqua* and *Cytisus proliferus*) with hot water or H_2SO_4, to hasten germination. The experiments were made at the Instituto Forestal de Investigaciones y Experiencias, Madrid. With *A. decurrens* seed germination was 57% in 7 days and 94% in 24 days by the hot-water treatment, and 84% in 2 days and 91% in 6 days by the acid treatment. In testing the permanency of the treatment, 83% germination was obtained, in 9 days, in an acid-treated sample sown 120 days after treatment. A convenient method of treating seed which is to be used without delay consists in immersing the seed in boiling water and leaving it until the water cools.

1773. **Seed germination.** *Rep. Wattle Res. Inst. S. Afr. 1948*, 1949 (20–1).

Complete removal of the seed coat of Wattle seed gave good germination within 24 hours. Various degrees of removal of the seed coat were then tried until it was found that a small cut through the coat at the distal end produced almost as rapid germination as complete removal of the seed coat. The germination of seed so treated was more even and rapid than that of seed treated with boiling water. Germination after boiling-water treatment was more even and rapid in small seed than in medium and large seed, a difference not apparent with seed germinated after cutting the coat. An investigation into twin frequency showed a higher frequency (5/8,200 seeds, compared with 1/13,000) of twin seedlings following cutting of the seed coat than after boiling-water treatment, which further confirmed the differential effect of the latter on germination.

1774. Souza, P. F. Resultados práticos obtidos em sementeiras de essências florestais. **[Practical results from seed tests of forest species.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (373–85). [Port.] P.R.

Data obtained from seed tests made over the period 1922–8 at the Horto Florestal de Gavea are presented in tabulated form. The following information is given for a large number of tree species:—date of seed collection, provenance, date of sowing, date of germination, quantity of seed sown, area sown, date of pricking out, length of roots and stem, and the number of seedlings obtained from the quantity sown, and per kg. of seed.

23.23.3. *Methods of Sowing*

1775. McQuilkin, W. E. **Direct seeding of trees.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (136–46).

A short survey of experiments in the U.S.A. in direct sowing of tree seed (both by hand and from aircraft) with some data on costs.

1776. Roe, E. I. **Sphagnum moss retards Black Spruce regeneration.** *Tech. Note Lake St. For. Exp. Sta.* No. 321, 1949. p. 1.

A study was made, on a clear-cut Black Spruce [*Picea mariana*] swamp, of spot sowing of Black Spruce. Initial germination was quite high, but at least half the seedlings were smothered during the first year by the faster growing sphagnum moss. Growth of the surviving seedlings was excellent. Loss from smothering by moss could be reduced a little by sowing the Spruce earlier (in late fall or early spring), but some method of killing or checking the moss (e.g. by chemical spray) is required for uniformly successful regeneration.

1777. **[Direct sowing in grassland.]** *Rep. For. Adm. Sierra Leone 1948*, 1949 (6).

Broadcast sowing of Nukui (*Holarrhena* sp.) and *Cassia siamea* was tried experimentally in an area of grassland in Tabe forest reserve. The best results were obtained when the grass was first removed, roots and all, and the ground hoed over, but at prohibitive cost (93*s.* 9*d.*/acre). Good germination of Nukui is, however, reported in areas where it was broadcast in standing grass without any previous treatment.

23.24. Formation of Stands by Planting

See also *For. Abstr.* 11 (Nos. 1752–3, 2390).

23.24.2. *Methods of Planting*

See also *For. Abstr.* 11 (No. 2265).

1778. Marritt, I. C. **Forest tree planters in Ontario.** *For. Chron.* 25 (3), 1949 (205–8).

Cf. *For. Abstr.* 10 (No. 2563).

23.26. Plant Rearing. Nursery Practice

See also *For. Abstr.* 11 (Nos. 1629–31, 1634–7, 1650, 2263).

1779. Hiley, W. E. **Some forest nurseries in Western America.** *Quart. J. For.* 43 (4), 1949 (167–73 + 8 photos).

An account of methods employed at large forest nurseries in British Columbia and Washington.

1780. Vincent, G., and Špalek, V. Prvá československá norma pre lesné školky. **[First Czechoslovak standard for forest nurseries.]** *Pol'ana* 4 (4), 1948 (78–9). [Slovak.]

According to data collected by the Forest Supervisory service in 1946 there were 150,000 ha. in Bohemia and 95,000 ha. in Slovakia destined for afforestation. On this basis a 5-year afforestation plan has been worked out and the yearly need of seedlings estimated at 468 million for Bohemia and 128 million for Slovakia. To raise these, nurseries must be extended or new ones set up and in accordance with the government's 2-year plan, the area of nurseries in Bohemia (1,222 ha. on October 1, 1946) is to be enlarged by 1,638 ha. and that in Slovakia (422 ha.), by 94 ha.

The State Research Station for Silviculture and Forest Biology, at Brno, made proposals on the standardization of nursery lay-outs which were subsequently taken up by the Silvicultural Branch of the State Research Council. Following the report of a select committee a scheme was worked out and approved by the Dept. for Forest Cultivation of the State Research Council on October 23, 1947, and by the extraordinary session of the Czechoslovak Standardization Society on February 5, 1948. The resolution of the meeting was published as ČSN–2,400–1948, the text of which, reproduced in the present article, contains specifications relating to the size and shape of nurseries, the size and spacing of paths and beds, direction and spacing of plant rows in the beds etc. The standard does not apply to nurseries of less than 0·20 ha. or to temporary nurseries.

1781. Bergman, F. A. Rationalisering i plantskolan. **[Rationalization in the nursery.]** *Skogen* 36 (13/14), 1949 (175–7). [Sw.]

Deals in general terms with possible improvements for small nurseries, with particular

reference to the advisability of trying out small 2-wheeled horticultural tractors of 4–8 h.p. Using these, it is possible to dispense with paths between transplant beds and to manage this section of the nursery as one large bed. Several other implements are briefly discussed and illustrated; these include:—a 'marking rake' which, when pulled along a marked centre line, sets out two nursery beds and a path between them by lines scored in the soil; a roller with annular projections for making 'pressed-in' seed drills; a scraper for filling the furrow in which transplants are set; and a 'weeding car', i.e. a frame mounted on 4 bicycle wheels, with a platform on which baskets etc. may be placed, and room for two weeders to work. The last-named is used for weeding in the rows of transplant beds with no paths, an operation which, unlike weeding between the rows, cannot be mechanized.

1782. GRAY, W. G. **The raising of Aspen from seed.** *For. Rec. For. Comm., Lond.* No. 2, 1949. pp. 7.

Summarizes the results of small-scale trials with Aspen [*Populus tremula*], which have been carried out at Kennington Nursery, Oxford, at various times since 1934. Seedlings should normally be lined out at the end of the first year at a spacing of not less than 4 in. in rows 12 in. apart. Cutting back to within 1 in. of the root collar after the first year's growth in the lines has been found effective in producing straight shoots on the majority of plants. Such cut-back 1/1 transplants should be re-lined in manured ground, at a spacing of 2 ft. within and 2—3 ft. between the rows, which permits of mechanical cultivation. Subsequent growth should be reduced, when *ca.* 6 in. high, to a single shoot per plant. On fertile soil the plants should be ready for lifting and planting in the forest one year after cutting back (i.e. as 1/1/1 stock). The 1/1 transplants normally average 2 ft. in height and the 1/1/1 stock, fit for forest planting, as much as 6 ft.

23.27. Arboriculture

See also *For. Abstr.* 11 (Nos. 1814, 2354).

1783. **[Shade trees for the U.S.A.]** *Yearb. Agric. U.S. Dep. Agric.* 1949 (48–85).

A collection of articles by various authors, giving brief notes on the appearance and characteristics of trees suitable for shade and ornamental purposes in the various regions of the U.S.A.

1784. ROOT, I. C., and ROBINSON, C. C. **City trees.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (43–8).

General recommendations on choice of trees for the city.

1785. MAY, C. **Keeping shade trees healthy.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (91–6).

Information on ways of maintaining suitable soil conditions, notes on common methods of disease control and scale drawings to illustrate form and comparative size of commonly planted shade trees.

1786. WARD, W. H. **The effect of vegetation on the settlement of structures.** *Proceedings, Conference on Biology and Civil Engineering (5th Session), 1948, Institution of Civil Engineers, London* 1949 (181–194 + 10 photos). 14 refs. P.R.

In the heavy clays of south-eastern England it may be assumed as a general working rule that the roots of isolated trees and shrubs extend laterally in open ground to a distance of at least the height of the plant and to a depth of 10 ft. Building structures will change the climate in their immediate neighbourhood and alter the ecological conditions of the soil. While plants do not generally grow under these structures, roots, especially tree and creeper roots, frequently extend under them and obtain moisture from the covered ground; particularly large shrinkage movements are caused where the groundwater level does not rise in winter, and during exceptionally dry seasons. Search has failed to find a traditional brick house on shrinkable clay in S.E. England with a row of Poplars about 15 or more years old, planted since the house was built, parallel to and 20 ft. or less from the side of the building, which has not suffered from visible movement and cracking during the periods 1942–5 and 1947. The tree-root drying effect sometimes causes cracks in the earthenware drains, the tree roots then entering the pipes and choking them with fresh growth. Typical examples of damage are described and illustrated by photographs. To avoid damage of this type, 2 principles may be followed: (1) placing the foundations

sufficiently deep for movements to be too small for cracking to occur; (2) having shallow foundations, but making the structure sufficiently strong to resist cracking. In S.E. England it appears to be uneconomical to found dwelling-houses sufficiently deep to avoid damage from trees and shrubs. The trees should, therefore, be planted so that their finest roots do not approach the structure.

1787. CRONEY, D., and LEWIS, W. A. **The effect of vegetation on the settlement of roads.** *Proceedings, Conference on Biology and Civil Engineering (5th Session), 1948, Institution of Civil Engineers, London* 1949 (195–202 + 5 photos). Extracts from the paper are also in *Roads and Road Construction, London* 26 (311), 1948 (404–5). P.R.

A survey has been made, by the Road Research Laboratory of D.S.I.R., from reports by county surveyors and local authorities in Southern England, on the effect of fast-growing trees, in most cases Poplars, on road foundations in town and country areas. The following conclusion were reached: (1) fast-growing trees planted close to roads are likely to cause settlement and surface cracking where the subsoil is heavy clay. Damage is most likely to occur where the clay has a high natural moisture content; (2) the effect may be serious in urban areas where the trees are set in paved footways or where rainfall distribution is affected by concentrated building; (3) on country roads, risk of damage is small, particularly where the trees are set well back from the roadway; (4) vegetation other than fast-growing trees is unlikely to cause settlement of roads. In periods of severe drought, however, any settlement of the surface which occurs may be increased by transpiration from any type of tree or shrub. The following tentative recommendations are made: (*a*) on heavy clay soils, fast-growing trees should not be planted within 50 ft. of the carriageway, and to minimize damage during very severe drought, only small slow-growing trees or shrubs should be used within 10 ft. of the carriageway or on central strips. Larger slow-growing trees may be used further back; (*b*) on loam and sandy soils, trees and shrubs can be planted freely. There is no reason why the use of fast-growing trees and shrubs should be abandoned; in most counties there are areas where they can safely be planted.

23.3. *Afforestation*

See also *For. Abstr.* 11
(Nos. 1599, 1622, 1647, 1763, 1811, 2380).

1788. CHAMPION, H. G. **Biology and technique of afforestation.** *Proc. World For. Congr.* No. 1, 1949 (14–20). [E.f.]

Reviews the factors to be taken into account (e.g. soil moisture, pH, and nutrient content; mycorrhizae; ground vegetation) and the methods employed (cultivation, sowing, planting, protection) in afforestation.

1789. GIORDANO, G. Le reboisement et la protection du sol. [**Afforestation and soil conservation.**] *Proc. World For. Congr.* No. 1, 1949 (21–9). [F.e.]

Reviews the various methods in which afforestation can be used to protect the soil, e.g. against sheet erosion, gullying, landslides, and to fix shifting sands.

1790. PAVARI, A. Alcune grandi opere di bonifica forestale e i loro insegnamenti. [**Some large-scale afforestation schemes and their implementation.**] *Repr.* from *Atti della Accademia dei Georgofili, Firenze* 1949. pp. 25. 14 refs. [It.]

Deals with the afforestation of the Landes, and afforestation operations in Great Britain and South Africa.

1791. **Britain's forests: Culbin.** H.M. Forestry Commission, London. 1949. pp. 17.

Gives a brief account of the formation and history of Culbin Sandhills on the Moray Firth, followed by a more detailed description of the methods adopted in afforesting them. The preparatory work consists in 'thatching' the dunes, by laying a covering of brushwood over the surface of the sand. Much of the material used for this purpose consists of branches cut from the lower parts of the stems of trees in the older plantations; these are fairly heavy and are usually laid with their butt ends pressed into the sand in a windward direction. Sometimes, on very exposed sites, a system of pegging with wire or wooden stakes is also employed. Birch and Broom, by-products of the weeding or cleaning of plantations, are also used to supplement the branches. Besides stopping sand from blowing, the brushwood has the merit of gradually decaying and adding humus to the soil. From 36 to 40 tons

of brushwood are required to the acre, representing the branches cut from about 4 acres of woodland. The best species for planting has been found to be Corsican Pine; nursery stock 2–3 years old is planted among the brushwood at *ca.* 5-ft. spacing. Thatching and planting are both carried out in the direction of the prevailing wind; about 4,000 acres have now been planted. Scots Pine and Lodgepole Pine are used in frost hollows or on shingle beds that do not suit the Corsican Pine. On the sand dunes themselves, Corsican Pine is now planted almost exclusively. It grows faster in height and puts on more volume than Scots Pine, and is very resistant to salt air. Plantations 25 years old now average 33–36 ft. high. Lodgepole Pine and Scots Pine regenerate themselves freely at Culbin.

1792. GUILLEBAUD, W. H. **Afforestation problems in Great Britain.** *C.R. Congr. int. Union For. Res. Organ., Zürich 1948*, 1949 (35–56). [E.f.g.]

1793. GOSLING, A. H. **The biology and technique of afforestation.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (27–8).

An account of the Forestry Commission's methods of afforesting peatland.

1794. ROHMEDER, E. Kahlflächen-Aufforstung. **[Artificial regeneration of cleared areas and afforestation of open land.]** *Forstw. Praxis, München* No. 1, 1948. pp. 127. Many refs. [G.] Price DM4.20.

A semi-popular manual for practical use under present conditions in Germany, covering all important aspects of the subject.

1795. BABOS, I. Az alföldi homokfásítás kérdései. **[Problems of afforestation on sandy areas of the Great Plain.]** *Erdész. Lap.* 85 (1), 1949 (2–5). [Hu.f.e.g.]

To hold shifting sand, hedges may be planted, 15–20 m. apart, at right angles to the direction of the wind. Robinia cuttings may be used, planted densely and standing 40–50 cm. high. Where the sand is more cohesive it is well to link these at 50–60 m. intervals with transverse sand-bars at a slight angle to the wind. For these, *Eleagnus* is suitable. Shifting dunes must not be ploughed, but the soil can be made more retentive by contour terracing with furrows. The low-lying areas between the dunes should be ploughed to a depth of 30–35 cm. Afforestation should always begin in these 'valleys', the tops of the dunes being left till last.

Only indigenous, or at any rate acclimatized, species should be chosen: in the 'valley', chiefly Robinia, White and Grey Poplar and Scots Pine. Only Austrian Pine is suitable for the sandhills.

The future prospect depends on the supply of enough plants of White and Grey Poplar, Scots and Austrian Pine. Experience proves that White and Grey Poplar are best grown on the Great Plain from 1-year-old seedlings, and Scots and Austrian Pine from 2-year-old seedbed saplings. The only seed-bearing stand of Scots Pine on the Great Plain (at Adacs) was destroyed (500 *holds* temporarily, 300 permanently) by flood in 1940. Thus seed must be acquired from Transdanubian stands, and, the writer recommends, from stands in areas with an annual rainfall not exceeding 600 mm. But Austrian Pine is really the most suitable species for bad sandy areas. The Ministry of Agriculture has taken over the classification of seed-bearing stands. Outstanding among these are the stands of Austrian Pine in the protected area of Adacs (168·5 holds). Though not indigenous, this is fully acclimatized to the most rigorous conditions of drought, floods, etc.

Seed production is the key to the problem of afforesting the bare areas of the Great Plain. The Budapest forest authorities are aware of its importance, and have a kiln of their own design at Adacs (described). The National Planning Office has agreed to the Hungarian State Forests' (MALLERD) plan for more kilns. There has been much improvization since the war and the first kiln included ball bearings from a crashed British aircraft. Its successor, unfortunately, runs on wooden bearings.

Future nurseries for the Great Plain would best be established in the dry parts of flood-areas, e.g. the Ráckeve authorities' Pine nursery at Domboriba.

1796. ROTH, J. **Technical requirements of afforestation in Hungary.** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (15–6).

1797. RABOUILLE, G. L'oeuvre forestière des mines du Nord et du Pas-de-Calais. **[Afforestation by the coal-mining companies of the Nord and the Pas-de-Calais.]** *Rev. for. franç.* No. 6, 1949 (267–70). [F.]

Between 1927 and 1931, the Société Forestière Douaisienne de Reboisement, formed by the coal-mining companies of the Nord and the Pas-de-Calais, established more than 10,000 ha. of plantations for the provision of mining timber. Scots Pine of Baltic provenance was chiefly used, and planted either on cultivated forest soils where the original stand has been felled, or amongst broadleaved coppice. Both types of plantations have proved very successful.

1798. GAUSSEN, H. L'étage subalpin, écologie et reboisement. **[The sub-alpine zone—ecology and afforestation.]** *Rev. for. franç.* No. 7, 1949 (324–6). [F.]

Deals largely with the success of *Alnus viridis*, introduced from the Alps, in afforesting high valleys in the Pyrenees where snow lies long and Pine cannot establish itself.

1799. HEIKINHEIMO, O. **Biology and technique of afforestation.** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (29–30).

An account of methods of afforestation used in Finland.

1800. TSCHERMAK, L. Karstaufforstung. **[The afforestation of Karst regions.]** *Schweiz. Z. Forstw.* 100 (1), 1949 (38–64). 29 refs. [G.f.]

Describes the region and the peculiar problems of afforestation which it presents, and gives an account of the afforestation carried out since 1842, first under the Austro-Hungarian Empire and later by the Italian and Jugoslav governments. [Cf. *For. Abstr.* 11 (No. 270).] On the lower, or mediterranean Karst, *Pinus halepensis* and *P.h.* var. *brutia* have been successful, and there are 50-year-old stands near Trieste and Pola. On the middle Karst (altitude 200–800 m.), *Pinus nigra* var. *austriaca* has given the best results, but *Abies cephalonica* has also been used with success. On the upper Karst (above 800 m.) Austrian Pine can be used up to 1,100 m. Where soil conditions permit, it may be mixed with *A. alba*, *Picea abies* and Beech. In Herzegovina and parts of Bosnia, the indigenous *Pinus leucodermis* is sometimes used. For Austrian Pine, 2-year-old planting stock is used, and for *P. halepensis* either 1- or 2-year-old. On sites capable of supporting more profitable species, Austrian Pine stands are regarded as transitory and are gradually converted. Operations begin when the Pine is about 25 years old, Beech and Fir being introduced under the opened stand. In the mediterranean Karst, Oak is also introduced this way.

1801. MEMELINK, G. Afforestations dans les Pays-Bas. **[Afforestation in the Netherlands.]** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (31–2). [F.]

Methods and species used in afforestation in the Netherlands.

1802. GALOUX, A. La reforestation des landes en Campine belge. **[Afforestation of heathland [*Calluneto-Genistetum*] in the Belgian Campine.]** *Abstr.* in *Bull. World For. Congr.* No. 4, 1949 (25–6). [F.]

1803. BLOEM, J. W. *Eucalyptus* in verband met het cultuurvraagstuk op arme gronden. **[*Eucalyptus* in connexion with the problem of afforesting poor soils [in Java and the Sunda Is.].]** *Tectona* 38 (3), 1948 (125–59). 14 refs. [Du.e.]

One of the most important problems for forest management in these islands, is the afforestation of poor soils in arid areas which are unsuitable for the cultivation of Teak. Several species (e.g. *Swietenia macrophylla*, *Dalbergia sissoo*, *Melaleuca leucadendron*, *Acacia auriculiformis*, *A. leucophloea*, *Casuarina equisetifolia* and *Eucalyptus platyphylla*) have been found suitable for this purpose, but only the first two are of commercial value. The Forest Research Institute at Buitenzorg had begun research before the war on possible species of *Eucalyptus* for afforestation, but the trial plots were mostly situated outside the arid areas. Notes are given on 37 species of Eucalyptus and the types of site for which they are suited.

23.4. *Formation of Forest by Natural Succession*

See also *For. Abstr.* 11 (Nos. 1751, 2252).

1804. ROBERTSON, W. M. **Twenty-four years growth in a young fire type stand.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 68 (F–2), 1949. pp. 11.

A series of 1-acre sample plots was established in 1925 in an area of several thousand acres in Newfoundland, which had been severely burnt in 1898. They were remeasured in 1932 and again in 1949. The soils are for the most part of the highest site

quality; the cover type was mixed Black and White Spruce, Balsam Fir, Larch, White Birch, and Poplar. The plots were thinned to four degrees of density, favouring Spruce in each case, and 24 years later natural mortality had further reduced the hardwoods, so that the cover type on all plots had changed to soft wood. The proportion of Fir had increased from 0–14% of the softwood stand to about 20%. The data suggest that if an increased rate of growth between 25 and 50 years is desired, this type of stand should be thinned before it reaches 25 years of age, and that up to 50 years there will be sufficient stems of merchantable size to cover cost of thinning from above. The ideal density for a stand of this type at 25 years seems to be 1,200 saplings of all species per acre, or a spacing of 6 ft. A more open stand may result in superabundant regeneration, perhaps of undesirable species. The growth rate on all 4 plots was remarkably high, but the experiment indicates that judicious thinning can greatly increase the growth rate and thereby shorten the rotation by at least 10 years, and that at 60 years of age plot C (1,220/acre) will have 25 cords, B and D (1,250 and 891 respectively) 20 cords, and the unthinned plot A (2,710) 15 cords. [Cf. *For. Abstr.* 10 (No. 179).]

23.5. *Underplanting. Nurses. Filling Gaps (Beating up)*

See also *For. Abstr.* 11 (Nos. 1757, 2272).

1805. STAHEL, G. **Notes on the root system of Immortelle (*Erythrina glauca*).** *Trop. Agriculture, Trin.* 26 (1/6), 1949 (61–2 + 4 photos).

E. glauca is generally used in Surinam as a shade tree for Cocoa plantations on the clay soils of freshly empoldered land. In badly drained soils, it forms a superficial root system with no tap-root, which competes with the Cocoa; deep drainage is therefore an important requisite for the successful cultivation of Cocoa on the stiff Surinam clay soils.

24. TENDING OF STANDS AND TREES

24.2. *Thinnings*

See also *For. Abstr.* 11 (Nos. 1804, 2349–50, 2360, 2412).

1806. LEIBUNDGUT, H. Von der Durchforstung zum Erziehungsbetrieb höchster Wertleistung. **[From thinning to tendings for maximum quality yield.]** *Schweiz. Z. Forstw.* 100 (1), 1949 (1–11). 59 refs. [G.f.]

An account of the evolution of the theory of thinning in France, Germany, Denmark and Switzerland, with particular references to the ideas of Schädelin, on the occasion of whose 75th birthday it was written.

1807. SARVAS, R. Harvennushakkuista. **[On thinnings.]** *Metsät. Aikak.* 1948 (12), (363–7). [Fi.]

A general account of the aims of thinnings, with particular stress on their influence on value increment. Various methods of thinning are reviewed in this light, the methods and grades of the Finnish Forest Research Institute being set forth in detail. In the author's view, Finnish thinning from above, which differs somewhat from standard Continental practice, may not necessarily lead to maximum increment in value.

24.3. *Opening of the Canopy. Release and Improvement Fellings (including Poisoning and Girdling)*

See also *For. Abstr.* 11 (Nos. 1926, 2254–61).

1808. THOMSON, C. C. **Releasing conifers in a young hardwood stand.** *Silv. Leafl. For. Serv. Can.* No. 34, 1949. pp. 2.

Scattered Spruce and Balsam Fir, *ca.* 50 trees/acre, in a stand consisting mainly of 20- to 30-year-old White Birch and Red Maple, were released in 1938 at a labour expenditure of one man-day/acre. Recent sampling indicates that the conifers 1–4 in. in diam. responded best, the growth expressed as simple interest being 42% as compared with 30% on the control area.

1809. WHITE, A. R. **The resins in coniferous wood.** *Pulp Paper Mag. Can.* 50 (11), 1949 (166–7).

During extensive experiments in the chemical treatment of live conifers, it has been noticed that trees girdled without the application of chemicals, or with application of chemicals of low toxicity, produce large quantities of resin at the girdle. If chemicals of high toxicity are used, however, resin is absent from the girdle and cannot be found on the sapwood after barking. The author suggests that poison girdling might be used in preparing Pine for the manufacture of sulphite pulp or newsprint.

1810. Herman, F. R. **Use of 'ammate' for poisoning Ponderosa Pine in stand improvement.** *Res. Notes Sthwest. For. Range Exp. Sta.* No. 118, 1949. pp. 5.

In this study, 90 limby Ponderosa Pines, 30–35 years old and 4–8 in. in diameter were divided into 3 groups of 30 each. Two sets were treated with ammonium sulphamate (ammate), (*a*) in crystals, (*b*) in solution, and the third with sodium arsenite. The results (given in a table) indicate that ammate in either form can be successfully used to kill Ponderosa Pine, and is about as effective as sodium arsenite.

24.4. *Shelterbelts. Windbreaks*

See also *For. Abstr.* 11 (No. 1617).

1811. Rol, R. L'arbre au Pays de Caux. **[Trees in the Pays de Caux.]** *Rev. for franç.* No. 8, 1949 (371–6 + 2 photos). [F.]

Gives a short account of the region, and suggests possible species suitable for planting in this extremely wind-swept area.

1812. Cappuccini, G. **[Species suitable for windbreaks in Sicily.]** *Giornale di Agricoltura, Rome* 59 (23), 1949 (184). [It.] A.P.B.

Cupressus sempervirens and various Eucalypts are suitable species but both are susceptible to salt-spray damage, and where there is danger of this, *C. macrocarpa*, *Acacia saligna* and *A. cyanophylla* should be substituted. Another very useful tree that might be tried for shelterbelts is the 'October Olive', a Calabrian variety, very hardy and wind-resistant, with numerous long, straight twigs forming a compact crown, growing rather tall for an Olive. It is a good fruit-bearer, the fruit ripening in October and yielding 16–16·5% of oil.

1813. Foscolo, E. Bétail de boucherie: un élevage à Jegu (Ituri). **[Raising store cattle at Jegu (Ituri).]** *Bull. agric. Congo belge* 40 (2), 1949 (1901–6). [F.]

Cattle in this part of the Belgian Congo are kept in paddocks enclosed either with wire fences or with windbreaks. Fence posts are of Eucalypt, seasoned for 4–5 months and then barked and charred for their whole length. Posts of 13-cm. diameter thus treated will last for 3–7 years in the ground, according to the proportion of heartwood. Black Wattle (*Acacia decurrens*) is used for windbreaks enclosing paddocks, to protect the pasture against drying winds and shelter the cattle from mid-day heat. Seed is sown within a double line of wire fencing to keep it from browsing cattle; where antelope are common, a paling of *Pennisetum* stems is necessary in addition. In the neighbourhood of native cultivation, rats are apt to eat the seed, which often makes resowing necessary. When the Black Wattle is about 3 years old, the wire can be attached to them and the fence posts removed for re-use elsewhere.

1814. **Trees best adapted for special purposes.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (845–54).

Lists trees suitable for shade trees, windbreaks and shelterbelts in various regions of the U.S.A. with tables giving the amount of sawtimber in trees by diameter and merchantable height by the International $\frac{1}{4}$-in. rule and the Doyle log rule and also the content of logs in bd. ft. by the Doyle log rule.

1815. Stoeckeler, J. H. **Windbreak and shelterbelt planting in the United States.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (35–6).

1816. Vanin, S. I. Mikoriza i eë znachenie dlya stepnogo lesorazvedeniya. **[Mycorrhiza and its importance for steppe afforestation.]** *Priroda, Moskva* 38 (8), 1949 (32–7). 26 refs. [Russ.] A.C.P.

A review, chiefly of Russian work and with main reference to the need for inoculating the soil of Oak plantations in the steppes with mycorrhizae from the roots of old Oak woods growing on similar soils. [Cf. *For. Abstr.* 11 (No. 289).] The need for further research is stressed.

1817. Bayko, V. P., and Gorbulenko, A. S. K voprosu o vozdeystvii polezashchitnŷkh polos na pochvu. **[On the influence of shelterbelts upon the soil.]** *Pedology* 1949 (6), (313–24). 6 refs. [Russ.] [Institut Zemledeliya Central'no-Chernozemnoy Polosŷ im. V.V. Dokuchaeva.] A.C.P.

Reports on the results of a study in 1943–6 in shelterbelts of various ages up to *ca.* 50 years and 6–106 m. in width, on similar soil (chernozem) and terrain in the Kamennaya Steppe. Details are given of composition (mixed hardwoods, chiefly Ash and Oak) and structure of

the belts. Results, which are tabulated, were as follows: (1) A litter layer is gradually established, having in wide shelterbelts the same characteristics as natural forest litter. Accumulation of litter begins at the age of *ca.* 5 years and it increasingly resembles that of natural forest as the shelterbelt ages. A belt 106 m. wide, planted in 1903, had 34·9 metric tons/ha. of litter, but another, *ca.* 6 m. wide and planted in 1905, only 4·2. Moisture absorption capacity of litter (in % of oven-dry weight) in the wider belts was 1½–2 times that of litter in the narrow ones. (2) Depths of the humus and 'transitional' (A + B) horizons were increased as compared with grassland and a field near by and the wider the shelterbelt, the more pronounced was this effect. (3) Soil structure under the belts showed a change from lumpy-granular to granular with a high stability. Furthermore, the wider the belt the greater was the water-stability of structural components > 1 mm., and the older the belt the more pronounced the development of structure, shown especially by the increase in the fraction > 1 mm., in the A horizon. (4) The depth of the snow cover and its water content in fields adjacent to shelterbelts was considerably higher than on open steppe. The snow cover and its water content were lower under wide than under narrow belts, a fact ascribed not only to the effects of width but also to shelterbelt structure, since the wide belts are more open and there is less drifting up than in narrow belts. (5) The spring moisture content of the topmost metre of soil beneath narrow belts was higher than beneath wide ones, but with the onset of summer this condition was reversed. The summer soil moisture of unmowed grassland was close to that of the shelterbelts, but mowed grassland had a distinctly lower moisture content, said to resemble that of a field under agricultural crops [but no data are given for the last-named]. (6) The greatest contents of total and water-soluble humus mostly occurred under the unmowed grass, and the least in the agricultural field, while mowed grass and shelterbelt soils were intermediate in this respect. These humus contents showed slight rises with increasing age, but were higher in narrow than in wide belts—a fact attributed to the presence of herbaceous vegetation in the former. Base adsorption and saturation, and pH values, showed trends parallel to those of the humus contents. (7) Determinations of the various humus fractions showed that soils of wide shelterbelts were richer in humic acids than soils of the narrow belts and the agricultural field. In general, this fraction predominated over the fulvic-acid fraction in the shelterbelt soils.

1818. Mal'chevski, A. S. Lesovodstvennȳe meropriyatiya i gnezdovanie ptits v polezashchitnȳkh polosakh. [**Silvicultural measures and the nesting of birds in shelterbelts.**] *Priroda, Moskva* 38 (6), 1949 (32–4). 18 refs. [Russ.] A.C.P.

This article is based chiefly on Russian literature together with personal observations. Present forestry research is focussed on shelterbelt structure, with the aim of creating shelterbelts that occupy as little agricultural land as possible and yet give maximum effect as windbreaks. The commonest type is a narrow belt (12–15 m. wide) with a wind-permeable 'openwork' structure designed to minimize breakage from heavy snowfalls. A light semi-open structure is considered best by entomologists as it promotes the health of the trees and resistance to attack. Ornithologists also favour narrow, relatively open belts as the nesting bird population is likely to be most dense in these. Each storey of the vegetation has its own associated avifauna, and the absence of any one storey will be reflected in the bird population. It is especially important that shrubs or low coppice should be present, as many small insectivorous birds nest in such growth. Any cleanings or thinnings should take place in autumn to winter, the resulting coppice being very favourable to some birds, especially warblers, e.g. whitethroats and barred warblers. Choice of tree species is also important in view of the nesting preferences of certain bird species.

In shelterbelts in the Stalingrad region the author found that magpies nested chiefly in *Elaeagnus angustifolia*, 31 out of 43 nests (including some of the previous year) being made in their species. In this case the large amount of *Elaeagnus* in the belt, by encouraging magpies, resulted in serious damage to cucurbitaceous crops. In *Caragana arborescens*, which gives little low cover unless cut back, nests are very rare. *Lonicera* [sp.?], however, and especially coppice of Elm and other tree species, were much favoured as nesting sites.

The more varied the composition of the belt itself, the richer its avifauna is likely to be.

24.5. *Pruning*

See also *For. Abstr.* 11 (No. 2360).

1819. PICKEL, D. B. J. Criação da forma florestal das arvores. [**Creation of form in trees.**] *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (49–70). 23 refs. [Port.port.] P.R.

General principles of pruning.

1820. LÜCKHOFF, H. A. **The effect of live pruning on the growth of *Pinus patula, P. caribaea* and *P. taeda* [in South Africa].** *J. S. Afr. For. Ass.* No. 18, 1949 (25–55 + 3 photos). 5 refs. [E.]

Data derived from a series of projects on live pruning initiated by the Research Branch of the S. African Forest Department in 1936, are set out in detail in a number of tables. All degrees of pruning were effected (1) on all trees in a stand, and (2) on selected stems. In both cases it was found that diameter growth was more severely affected than height growth by live pruning.

Where all trees are pruned, the factor of unequal competition between pruned and unpruned trees is eliminated and trees can better withstand severe live pruning and also recover their normal increment more rapidly. Although the data presented on the pruning of all stems in a stand are limited and subject to criticism, they indicate that even with the severest degree of pruning, normal increment is regained within *ca.* 2 years after treatment, and that after this the possibility of absolute recovery of the initial loss in increment exists. The recovery of normal increment is much less rapid where selective pruning is practised, and generally takes 3–5 years and sometimes even longer. The initial set-back to diameter and height growth also appears to be absolute and, at least in the case of diameter, it is unlikely that the loss will be made up during the rotation.

The removal of 25% of the vigorous crown of the tree has no effect on either diameter or height growth; the removal of 50% has a significant effect on mean diameter, while height is unaffected; and the removal of 75% has a significant effect on both.

Between the ages of 4 and 8 years, the effect of selective live pruning on growth is roughly in inverse proportion to the age at which stands are pruned.

In the species under investigation, the ability to withstand severe live pruning is markedly increased in stands growing on poor third-quality sites.

In selective pruning, breast-height form factor is usually unaffected by pruning intensities removing 25% of the vigorous crown, and frequently improved by heavier pruning. Mean taper values, when worked out for 10-ft. sections of bole, are significantly decreased in the region above and below the lowest whorl of branches but unaffected in the lower parts of the bole and upper parts of the crown. In no instance was mean taper found to be adversely affected by even the severest live pruning.

Heavy selective live pruning frequently causes a significant decrease in mean branch basal area in the first 5 ft. of crown and never any increase. Occasionally mean branch thickness is increased on the lowest whorl or two, but such increase is always offset by a decrease in thickness in the succeeding whorls. *From author's summary.*

1821. **[The healing of pruning wounds in Douglas Fir.]** *Rep. B.C. For. Serv. 1948*, 1949 (24).

Douglas Fir trees 13 years old, live-pruned in July and September 1942, had healed 96 and 95% respectively of their knot areas by September 1944. These and other trees aged 17 years were pruned in June and September 1946, and these showed 95% of knot area healed by August 1948. Thus age made no difference to rate of healing, but the autumn-pruned trees recovered somewhat faster than the summer-pruned. The pruning in 1942 demonstrated that healing is facilitated when part of the living tissue forming a collar at the base of branches is removed in pruning. It appears to be detrimental to remove much of the collar.

3. FOREST UTILIZATION. FOREST TECHNOLOGY

See also *For. Abstr.* 11 (Nos. 1563, 2402).

1822. GAYER, K. Die Forstbenutzung. **[Forest utilization.]** Paul Parey, Berlin and Hamburg. 1949. pp. xv + 733. Many refs. as footnotes. [G.]

This edition, produced under the editorship of Dr. Ludwig Fabricius, contains certain essential alterations from the previous edition of 1935.

1823. DOPF, K. Unsere Nutzhölzer. **[Our timbers.]** Georg Fromme & Co., Vienna. 3rd (rev.) ed., 1949. pp. 228. [G.]

A semi-popular manual including sections on:—German and Austrian trees and their woods, and some common imported woods, with a key for identification by macroscopic characters; properties and uses, indicating woods suitable for particular purposes; defects, fungus and insect damage; wood preservation; 'artificial wood' (improved wood, wallboards etc.); and cork. An appendix deals briefly with wood chemistry and the chemical conversion of wood.

1824. **List of publications [presenting results of research by the Forest Products Laboratory, Madison] on logging, manufacture, and utilization of timber, lumber, and other wood products.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*790, 1949. pp. 17. P.R.

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31.0 *General Information on Woods*

See also *For. Abstr.* 11 (Nos. 1580, 1696, 1701).

1825. [COX, H. A.] **Wood specimens. A series of selected timbers reproduced in natural colour with introduction and annotations by H. A. Cox, M.A.** The Nema Press, Proprietors of 'Wood', London. 1949. pp. 206. Price £2. 2*s*.

A bound volume containing 100 of the supplements published in *Wood* since 1936.

1826. **Specimen woods Nos. 166–7.** *Suppls.* to *Wood* 14 (10–11), 1949 (307–8; 343–4).

Whitewood (*Picea abies*) and Yellow Pine (*Pinus strobus*).

1827. JAY, B. A., and WOODS, R. P. **New timbers and their uses.** *Quart. Rev. Timb. Developm. Ass., Lond.* 2 (2), 1948 (8–15).

Lists some 100 species imported into Great Britain under the Hardwood Overseas Procurement Scheme Part III, during 1947, giving botanical and commercial names, country of origin, weight, colour, uses and other points of interest for each species.

1828. HART, G. **Malayan timbers.** *Quart. Rev. Timb. Developm. Ass., Lond.* 2 (6), 1949 (19–20).

A list of 17 Malayan timbers with botanical, commercial and vernacular names, and a description of their properties and uses.

1829. THOMAS, A. V. **White and Yellow Meranti timber.** *Malay. Forester* 12 (3), 1949 (136–40 + 2 photos).

Discusses the properties and defects of the two groups of *Shorea* spp. commonly known as White and Yellow Meranti respectively, together with specific weight of 17 species, and means of distinguishing the two types.

1830. **Six hardwoods available for licensing.** *Woodwkg. Ind.* 6 (9), 1949 (535–6). P.R.

Describes the appearance and working properties, and suggests uses for 6 Nigerian hardwoods (*Antiaris africana, Distemonanthus benthamianus, Terminalia ivorensis, Canarium schweinfurthii, Piptadenia africana* and *Daniella ogea*).

1831. SCHMIDT, E. Übersee-Hölzer, Nr. 2–10. **[Foreign woods, Nos. 2–10.]** *Suppls.* to *Weltholzw.* 1 (2–11), 1949. Each pp. 2. [G.] P.R.

These supplements, each of which contains references to literature, deal with:—Courbaril (*Hymenaea courbaril*), Assacu (*Hura crepitans*), Eng (*Dipterocarpus tuberculatus*), Quaruba (*Vochysia* spp.), Guatambu (*Balfourodendron*

riedelianum), Jequitiba (*Cariniana legalis*), Ilomba (*Pycnanthus kombo*), Dabema (*Piptadenia africana*), and Movingui (*Distemonanthus benthamianus*).

1832. LAMB, G. N. **Foreign woods, origin, use, properties and nomenclature. [Courbaril (*Hymenaea courbaril*), Angelique (*Dicorynia paraensis*), Yellow Sanders (*Buchenavia capitata*) and Guayacan (*Tabebuia guayacan*).]** *Wood Prod.* 54 (10), 1949 (24–5).

1833. TEJADA Y SAINZ, J. DE D. **A glossary of Cuban woods.** Editora Mercantil Cubana, S.A., Habana, Cuba. 1947. pp. 82. 40 refs.

Lists Cuban timbers of commercial interest under their popular Cuban names, giving alternative names, the scientific name and English equivalents, and notes on the appearance, properties and uses.

1834. PEREIRA, J. ARANHA. Madeiras tropicais do Brasil para o mercado mundial. **[Tropical woods of Brazil for the world market.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (108–12). [Port.] P.R.

Contains a list of exotic tropical woods of high value in the European market, with the corresponding Brazilian species that resemble them most closely in (1) appearance, and (2) physical and mechanical properties.

1835. LESCHNER, F. Das Araucarien-Holz Südbrasiliens und seine wirtschaftliche Bedeutung. **[Southern Brazilian Parana Pine and its commercial importance.]** *Weltholzw.* 1 (3), 1949 (25–30). [G.] P.R.

Discusses the distribution and growth characteristics of *Araucaria angustifolia* in Brazil, describes the physical properties of its wood and gives figures of exports, with grading rules.

1836. ALMEIDA, D. G. DE; ARAUJO, P. A. DE MATTOS; AZAMBUJA, D. DE. Fichas dendrológicas comerciais e industrais de madeiras brasileiras. **[Dendrological, commercial and industrial notes on Brazilian timbers.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (342–72). 72 refs. [Port.] P.R.

A series of short studies by individual authors, each with its own bibliography, on some of the most important Brazilian timber trees. They consist of brief notes on botanical characteristics, wood anatomy, properties and uses, and on the part played by each timber in Brazilian trade and industry. The following species are dealt with:—Canela Parda (*Nectandra* sp.), Cedro (*Cedrela fissilis*), Imbuia (*Canela imbuia*), Ipê Peroba (*Paratecoma peroba*), Ipê Tabaco (*Tecoma longiflora*), Jacaranda Caviúna (*Dalbergia nigra*), Peroba Rosa (*Aspidosperma polyneuron*), Pinheiro Brasileiro (*Araucaria angustifolia*) and Sucupira Parda (*Bowdichia virgilioides*).

1837. RANGHEL GALINDO, A. Maderas industriales de Colombia. **[Industrial woods of Colombia.]** *Carib. For.* 10 (3), 1949 (161–96). [Span.E.]

Notes on 26 Colombian timber-producing species, giving information on distribution, botanical characteristics and properties, and uses of the woods.

1838. GUINIER, P. Le Douglas. **[Douglas Fir [: its distribution, properties and uses].]** *Rev. Bois Appl.* 4 (6), 1949 (16–9). 5 refs. [F.]

1839. ROL, R., and VENET, J. Le charme. **[Hornbeam.]** *Rev. Bois Appl.* 4 (9/10), 1949 (8–11). [F.]

Gives notes on the distribution and botanical characteristics of Hornbeam, and describes the anatomical structure, properties and uses of its wood.

1840. BARTH, J. Les utilisations du bois de noyer. **[The uses of Walnut.]** *Rev. Bois Appl.* 4 (9/10), 1949 (12–6). [F.]

Describes the manufacture of sawn and peeled veneers, sawn goods, gun stocks, sabots and turned goods from Walnut.

1841. FERGUSON, J. H. A. ***Eucalyptus deglupta* Bl.** *Rapp. Bosbouwproefsta. Buitenzorg* No. 13, 1949. pp. 8. 8 refs. [Du.e.] P.R.

Discusses the distribution and growth of *E. deglupta* in Indonesia and the properties of the wood.

31.1. *Structure. Anatomy. Identification*

See also *For. Abstr.* 11 (Nos. 1590, 1895, 2035–6, 2047, 2175).

1842. NARAYANA NAMBIYAR, V. P. **Application of spectroscopy to timber wood identification.** *Science and Engineering, Calcutta* 2 (6), 1949 (114–9). 4 refs.

A study was made of the absorption spectra of aqueous and alcoholic extracts of 16 common Indian species. It was found that the extract of each wood gave distinct and characteristic bands of absorption. It is suggested that the method might be developed for timber identification. [Cf. *For. Abstr.* 10 (No. 1849).]

1843. Cozzo, D. Un sencillo procedimiento para reconocer la madera de *Enterolobium contortisiliquum* (pacará o timbo colorado). [**A simple method of identifying wood of *E. contortisiliquum*.**] *Rev. argent. Agron.* 16 (3), 1949 (180–2). [Span.] E.M.B.

The difficulty of making a clear distinction by microscopic methods between wood of *Enterolobium contortisiliquum* and *Cedrela* sp. can be solved by means of some simple chemical tests, based on the fact that wood of *E. contortisiliquum* contains saponin. The tests are described.

1844. Koehler, A. **Key for the identification of woods without the aid of a hand lens or microscope.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (833–44). [Forest Products Laboratory, Madison, Wis.]

1845. Susmel, L. Guida pratica per il riconoscimento dei legni più comuni. [**A practical key for the identification of the commoner timbers.**] *Ital. for. mont.* 4 (4), 1949 (233–41 + 2 keys). [It.]

1846. Azambuja, D. de. Algumas considerações sôbre as técnicas mais empregadas na anatomia das madeiras. [**Methods most commonly used in wood anatomy.**] *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (236–54). 7 refs. [Port.] P.R.

An exposition of current technique.

1847. Ritter, G. J. **Microstructure of wood and wood fibers.** *Tappi, Easton, Pa.* 32 (1), 1949 (11–20). 26 refs. L.S.

A general review, with discussion on the influence of wood structure on the pulping process.

1848. Mark, H. F. **Submicroscopic structure of wood constituents [: cellulose].** *Tappi, Easton, Pa.* 32 (3), 1949 (108–9). [Institute of Polymer Research, Polytechnic Institute of Brooklyn, Brooklyn, N.Y.] L.S.

1849. Siegel, B. M. **The structure of cellulose in the electron microscope range.** *Tappi, Easton, Pa.* 32 (3), 1949 (109–16). 4 refs. [Institute of Polymer Research, Polytechnic Institute of Brooklyn, Brooklyn, N.Y.] L.S.

1850. Wredden, J. H. **The microscopic examination of plastic materials. VII. Mouldings [including wood flours.]** *Plastics, Lond.* 12 (130–9), 1948 (152–60; 208–15; 266–73; 323–9, 334; 381–7; 436–43; 496–501, 506; 551–7; 607–13; 662–9); 13 (140–6), 1949 (45–51; 101–7; 157–63; 205–11; 274–80; 333–8; 388–94). 3 refs. P.R.

1851. Wardrop, A. B. **The influence of pressure on the cell wall organisation of conifer tracheids.** *Proceedings, Leeds Philosophical and Literary Society (Scientific Section)* 1948 (128–35 + 1 photo). 16 refs. Ld.U.

The application of external radial pressure upon growing conifer stems results in the differentiation of shorter tracheids with a flatter spiral micellar organization than those differentiated in comparable regions of the stem but not subject to compression. It is suggested that the shorter tracheids arise as the result of an increased number of transverse divisions in the cambium.

The radial pressures normally operating upon the growing cambium are not considered to be responsible for the progressive increase in length of the tracheids in successive annual rings; the increase is attributed to the seasonal flow of growth hormones accompanying the opening of the buds and the resumption of apical growth. *From author's summary.*

1852. **Cell wall and fibre studies. Growth studies. Sapwood and heartwood.** *Rep. For. Prod. Aust. 1948–9*, 1949 (6–10).

[Cf. *For. Abstr.* 10 (No. 1852).] (1) *Cell wall organization.* Recent investigations on the compression wood of *Pinus radiata* have shown that the compression-wood tracheids are appreciably shorter than would be expected for normal wood in a comparable position in the tree. It would appear, however, that such tracheids are essentially similar to normal wood tracheids of the same length in cell-wall organization, although differing in chemical composition. This would suggest that in comparing properties, the comparison should be made between compression wood and normal wood with tracheids of equal length, i.e. with wood from an earlier growth ring rather

than the same ring. Electronic micrographs have shown that the fibrillar orientation of the inner layer of the secondary wall is in a relatively flat spiral in relation to the major fibre axis. Confirmatory evidence was also obtained of the steep fibrillar spiral of the middle layer of the secondary wall.

(2) *Fibre length variation.* It has been established that there is a considerable variation in fibre length within one growth ring of *Eucalyptus gigantea* and other Eucalypts with prominent growth rings; the shortest fibres were found in the first-formed early wood and the longest, approximately 50% longer, in the last-formed late wood. Investigation on hardwoods from different parts of the world shows that in all hardwoods with definite growth rings considerable variation in length in one growth ring can be expected, but that in hardwoods grown in tropical conditions no great variation in fibre length occurs. Preliminary work on coniferous timbers suggests that late-wood tracheids are slightly but significantly longer than early-wood tracheids.

(3) *Growth studies.* In any one growth ring of *Eucalyptus gigantea*, fibres were shortest where growth rate was at a maximum, just after the beginning of early-wood formation, and the short early-wood fibres were of greater diameter than the longer late-wood fibres. It has been established that the production of concentric bands of parenchyma found in *Beilschmiedia bancroftii* is not related to the season of the year; it seems possible that there is a correlation between the woody tissues laid down and the photosynthetic activity of the tree.

(4) *Sapwood and heartwood.* Investigations have shown that conditions responsible for the development of tyloses in woods with large vessel-ray pitting are also responsible for the secretion of gum in woods with small vessel-ray pitting; both tyloses and gum are always developed from the ray cells. The examination of the content of ray cells in material specially fixed immediately after felling, has shown that timbers may fall into 3 classes in which: (1) The ray cells remain alive for a very long time and starch may be found at the centre of very large trees. When a coloured heartwood is found it seems to be due to fungal attack which kills the nuclei, uses up the starch and discolours the timber. (2) The ray cells may remain alive for a very long time but there appears to be a progressive death of the cells starting at the periphery. In these woods it seems as if a time comes when there are insufficient living cells left to keep the tissues alive, and the change from sapwood to heartwood then takes place. (3) The ray cells remain alive for only a short time. Here there is a narrow sapwood and a comparatively sudden death of the cells at heartwood formation. As yet there is no clue as to the nature of the factor causing death.

1853. MINERVINI, I. L'evoluzione della cerchia legnosa in *Viburnum tinus* L. dal Dicembre 1946 al Novembre 1947 a Bari. **[The development of the annual ring in *Viburnum tinus* from December 1946 to November 1947 at Bari.]** *Nuovo G. bot. ital.* (*n.s.*). 55 (4), 1948 (433–34 + 6 photos). 3 refs. [It.it.e.] O.B.D.

31.2. *Physical Properties*

31.21. Conductivity

1854. BILLINGTON, N. S. **Thermal insulation.** *Construct. Res. Bull. Timb. Developm. Ass., Lond.* No. 4, [1949?]. pp. 11. 11 refs. P.R.

Discusses the general principles and practice of thermal insulation, and comments on and gives figures for the thermal properties of commonly used materials including fibreboards, wood wool, plywood and timber.

1855. Le bois isolant phonique. **[Wood as a sound insulator.]** *Rev. Bois Appl.* 4 (6), 1949 (31–2). [F.]

Gives tables showing the speed of sound in passage through different species of wood and through air, water and some metals, and the sound-absorption properties of brick, softwoods, plywood and fibre boards.

1856. BARDUCCI, I., and PASQUALINI, G. Misura dell'attrito interno e delle costanti elastiche del legno. **[Measuring the internal friction and the elastic parameters of wood.]** *Nuovo Cimento, Bologna* 5 (5), 1948 (416–46). 12 refs. [It.it.e.] O.R.S.

The elastic parameters and the internal friction of energy in wood have been measured by a method involving the measurement of the resonance frequencies and coefficients. (1) The sound velocity c and the coefficient of

resonance Q are dependent on the direction of the sample, but the ratio c/Q is practically independent of direction and of frequency; (2) The angle between the direction of the elastic waves and that of the fibres is, as a first approximation, where c and Q are concerned, sufficient to allow the determination of the direction of the test piece; (3) The conifers show a regularity of elastic and dissipative properties absent from deciduous species; and (4) the elastic parameters and resonance coefficients of very old woods appear to undergo considerable modification by aging. A number of tables give the mean values for the main elastic parameters and resonance coefficients of the 85 species examined.

31.22. Relation to Water, Air, Gases

See also *For. Abstr.* 11 (Nos. 1985–7, 2076, 2105).

1857. RICE, W. W., and DICKINSON, F. E. **The calibration of two types of moisture meters for several tropical woods.** *Technical Report, Yale School of Forestry* No. 2, 1949. pp. 5 + 3 tbls. P.R.

1858. PERRY, T. D. **How to solve some of the problems encountered in moisture content.** *Wood Prod.* 54 (9), 1949 (35–9).

The standard practice of calculating the moisture content of wood by finding the weight of water evaporated from a test piece and expressing it as a % of the oven-dry weight of the same specimen leads to some anomalies, since there are considerable variations in the specific gravity of woods of different species. The actual weight of moisture contained in different species at 10% moisture content is therefore not constant. This fact is illustrated by a table showing sp.gr., weight of wood and actual weight of water at 10% moisture content for 41 hardwood and softwood species. The author believes that this lack of equivalency may be responsible for many of the difficulties encountered by woodworkers.

1859. KOLLMANN, F. **Sorption and swelling of wood.** *Transl. Inform. Serv. Coun. sci. industr. Res. Aust.* 1949. pp. 32 + 5 dgms., 16 gphs. 66 refs. Transl. by M. Slade from *Naturwissenschaften, Berlin* 32 (14/26), 1944 (121–39). [*For. Abstr.* 8 (No. 1824).] P.R.

1860. BARKAS, W. W. **The swelling of wood under stress.** H.M. Stationery Office, London. 1949. pp. iv. + 103 + 2 photos. 42 refs. Price 6*s*. [Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks.] I.F.B.

The book, which is based on a series of lectures given at the Svenska Träforskningsinstitut, Stockholm, gives an account of the theory developed at the Forest Products Research Laboratory, Princes Risborough, of the swelling of natural wood, of its structural fibre and of the gel material composing the fibre wall. It consists of chapters on: Structure, sorption and swelling; anisotropic elasticity; swelling stresses in elastic gels; plasticity; and sorption hysteresis.

1861. TARKOW, H. **The swelling and shrinking of wood, paper and cotton textiles and their control.** *Tappi, Easton, Pa.* 32 (5), 1949 (203–11). 15 refs. [U.S. Forest Products Laboratory, Madison.] L.S.

1862. STAMM, A. J., and TARKOW, H. **Wood, a limited swelling gel.** *J. phys. colloid Chem.* 53 (2), 1949 (251–60). 14 refs. [U.S. Forest Products Laboratory, Madison.] D.S.I.R.

It has been shown that wood behaves as a gel of the limited swelling type. The restraint to unlimited swelling results from the peculiar type of orientation of the micelles in the outermost and innermost layers of the cell wall. It has also been shown that on loading the wood substance with various materials, the volume of many species of wood increases by an amount equal to the volume of the inert material. Balsa is an exception. Here the increase in volume, on adding a bulking agent, may be as much as 3 times the volume placed in the wood substance of Balsa. The bulking effects make possible the dimensional stabilization of wood, for although the dry dimensions of wood are increased, the water-swollen dimensions are not affected. *Authors' summary.*

1863. BATEY, T. E., and WANGAARD, F. F. **Moisture absorption in certain tropical American woods.** *Technical Report, Yale School of Forestry* No. 1, 1949. pp. 7 + 17 gphs., 3 tbls., 1 dgm. [Project N6-ori-44, Task Order XV, Office of Naval Research, United States Navy.] P.R.

The results of tests of water absorption on 25 tropical American species and, for purposes of comparison, on native White Oak (*Quercus alba*) and Burma Teak (*Tectona grandis*), are given in graphs and tables, and the timbers are classified according to: (1) the over-all absorption of moisture into the heartwood; and (2) the side-grain absorption of moisture into the middle portion of the heartwood of end-coated specimens. (1) Five species—Bullet-wood (*Manilkara bidentata*), Gonçalo Alves (*Astronium graveolens*), Guayacán (*Tabebuia guayacan*), Determa (*Ocotea rubra*), and Castanha do Para (*Bertholletia excelsa*)—absorbed considerably less moisture than Teak at 15%, while White Oak showed an increase in moisture content of 44·6%, exceeded by only 4 other species. (2) Teak showed the same relative position as in (1), although the amount of moisture absorbed was much lower, and the same 5 species again showed lower moisture increases than Teak. Many species occupied nearly the same relative position in both tables but White Oak, Vaco (*Magnolia sororum*) and Masa (*Tetragastris balsamifera*) occupied relatively much lower positions than in (1).

1864. STAMM, A. J. **Passage of materials through wood, paper, cellulosic membranes, and fabrics.** *Tappi, Easton, Pa.* 32 (5), 1949 (193–203). 44 refs. [U.S. Forest Products Laboratory, Madison.] L.S.

A review of research with discussion. [Cf. *For. Abstr.* 11 (No. 1095.)]

31.23. Weight. Specific Gravity

See also *For. Abstr.* 11 (Nos. 2045, 2173).

1865. LEONT'EV, N. L. O zonal'nom raspredelenii fizikomekhanicheskikh svoystv v stvolakh drevesinȳ sosnȳ. **[The zonal distribution of physico-mechanical properties in stems of Scots Pine.]** *Priroda, Moskva* 38 (6), 1949 (60). 1 ref. [Russ.] A.C.P.

Data on the density, crushing strength and impact bending strength of Scots Pine butt logs 6 m. long, showed such close correlation of the variations of these properties with position in the log that it was possible to combine them in a single series of sectional diagrams (radial longitudinal and transverse top and butt sections) reproduced with the present note. Values for all these properties decreased regularly from butt to top. Radially from the periphery inwards, they first increased to a maximum and then steadily declined through the heartwood.

1866. **Schedule of weights of building materials.** *Brit. Stand.* No. 648, 1949. pp. 29. P.R.

Gives a table of weights for different building materials, including blockboard, boarding, fibreboards, wood floors, plywood, Cedar-wood shingles, seasoned timber and weather-boards, and includes a list of some 60 timbers showing the weight in lb./cu. ft.

31.24. Calorific Value

1867. **[Calorific value of *Acacia campylacantha* and *A. arabica*.]** *Rep. For. Dep. Tanganyika 1947*, 1949 (11).

Both are excellent fuelwoods, *A. campylacantha* being only slightly inferior to *Eucalyptus robusta*.

31.27. Mechanical Strength

See also *For. Abstr.* 11 (Nos. 1860, 1865, 1911–2, 1979–84, 2150, 2173, 2212–4, 2217, 2224, 2229).

1868. **List of [American] publications on mechanical properties and structural uses of wood and wood products.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*200 (rev.), 1949. pp. 48. P.R.

1869. **Timber physics: studies of creep in wood.** *Rep. For. Prod. Aust. 1948–9*, 1949 (20–1).

Recovery tests on initially green beams previously loaded for periods of a year or more, have shown that at least half the increased deflection due to long-time loading is recoverable. Air-dry beams under load for more than a year have reached deflections of about 3 times the initial value, a much lower figure than for comparably loaded initially green beams. A few recovery tests on dry beams gave results similar to those on initially green beams. The decrease in length of the compression face under prolonged loading is greater (1·5 to 3 times) than the increase in length of the tension face. The strain rate of beams fluctuates with atmospheric temperature, increasing noticeably by day and decreasing at

night. Model beams are being used in tests for temperature effect under controlled conditions and out of doors. Work has been started on small beams consisting entirely of reaction wood. Mountain Ash [*Eucalyptus regnans*] tension specimens at 14% moisture content and 35° C. have been tested under prolonged loading at 1,000, 2,000, 3,000 and 5,000 lb./sq. in. The proportional increase in strain does not appear to be nearly as great as for beams nor does it continue so long. Tension specimens after a period of prolonged loading sometimes show greater recovery than beams, in some cases as much as 70–85% of the strain of long-time loading being recoverable. A few trial shear tests showed a marked decrease in shearing strength under prolonged loading.

1870. Heck, O. S. **The risk of breakage with double-axially stressed wood. [A method of ascertaining the safety margin mathematically.]** *Transl. Minist. Supply* No. GDC 16/34T [*n.d.*]. pp. 6 + 13 gphs., 5 tbls. 12 refs. Transl. from *Focke-Wulf Report* No. 12001, Dec. 1942. P.R.

31.28. Working Qualities

See also *For. Abstr.* 11 (No. 1895).

1871. **[Working qualities of S. Rhodesian timbers.]** *Rep. Div. For. S. Rhod. 1948*, 1949 (10).

Lannea discolor tends to clog the saw when cut wet, but the planks dry to a clear white timber which nails well. *Monotes glaber* quickly takes the edge off a saw.

1872. Davis, E. M. **Machining of Madrone, California Laurel, Tanbark Oak and Chinquapin.** *Rep. U.S. For. Prod. Lab., Madison* No. R1727, 1947. pp. 5 + 1 tbl. P.R.

Madrone [*Arbutus* sp.], Tanbark Oak, [*Lithocarpus densiflorus*], and California Laurel [*Umbellularia californica*] are heavier and harder than most North American hardwoods. They would probably require more power to machine, and they probably blunt tools rather more rapidly than do lighter and softer hardwoods. On the other hand, they tend to give very good results as regards smoothness of cut. Chinquapin [*Castanopsis* sp.] is considerably lighter and softer and does not machine so smoothly, although it offers less resistance to the cutting action of tools. The principal machining properties of 29 hardwoods, including these 4 West Coast woods, are tabulated.

31.3. *Chemical Properties*

See also *For. Abstr.* 11 (Nos. 1600, 1842–3, 2018–26, 2037, 2045, 2049–50, 2059, 2122–9).

1873. Reiff, F., and Haas, H. Die chemische Zusammensetzung der Holzsubstanz. **[The chemical composition of wood.]** *Angewandte Chemie, Weinheim* 61*A* (5), 1949 (210–8). 66 refs. [G.] D.S.I.R.

1874. Benet, P. J. **Capillary analysis of Argentine woods.** *Revista de la Facultad de Química Industrial y Agrícola, Sante Fé* 15/16 (26), 1946/7 (108–19). *Chem. Abstr.* 43, 1949 (1565). O.R.S.

Wood samples were rasped, added to 90 parts of 95% EtOH and macerated for 24 hours. Pieces of filter paper 2 × 20 cm. were suspended so that 15–20 mm. would dip into 10-c.c. aliquots of the filtrates of these extracts. The colours, under different lighting conditions, of different zones appearing on the filter paper strips are tabulated for 32 types of wood.

1875. Bailey, A. **Adsorption chromatography of lignin.** *Paper Industry and Paper World, Mount Morris, Ill.* 31 (2), 1949 (205–9). 9 refs. [University of Washington.] L.S.

Studies of the adsorption of lignins (from Western Hemlock, from mixed hardwoods and from sulphite waste liquor from Western Hemlock) on cellulose, using different solvents, show the separation of the lignin preparations into chromatographically distinct portions; this suggests that the lignin portions are physically or chemically distinct.

1876. Jones, E. J. **The infrared spectrum of native Spruce lignin.** *Tappi, Easton, Pa.* 32 (4), 1949 (167–70). 7 refs. [Institute of Paper Chemistry, Appleton, Wis.] L.S.

The infrared spectrum of the native Spruce lignin of Braun was determined in film form and in Nujol dispersions from 3,700 to 720 cm.$^{-1}$. Bands arising from hydroxyl and aromatic and aliphatic carbon-hydrogen groups are identified, and an aldehyde or keto carbonyl group in low proportion is established as the source of a weak band at 1,663 cm.$^{-1}$ through

comparison of the spectra of its methylation products. Tentative evidence indicating the aromatic and aliphatic carbon-oxygen source of other bands is given. Fractionation of native Spruce lignin and comparison of the spectra of the fractions showed variation only in the strength of the carbonyl band. The spectra of 5 lignin preparations from Spruce are compared and shown to be basically similar; the spectrum of native Aspen lignin was found to be quite different. Examination of a large number of so-called model lignin compounds failed to reveal any over-all spectral similarity to lignin. A group of carbohydrate and tannin materials were examined and their spectra contrasted with the lignin spectrum. [Cf. *For. Abstr.* 10 (No. 1116).] *Author's summary.*

1877. ERDTMAN, H. **The chemical nature of lignin [:a review of the chemistry of lignin illustrated by formulae].** *Tappi, Easton, Pa.* 32 (2), 1949 (71–4). [Kungl. Tekniska Högskolan, Institutionen för Organisk Kemi, Stockholm.] L.S.

1878. HOLMBERG, B. Espenhölzer und Mercaptosäuren. (Ligninuntersuchungen, XVII). **[Aspen woods and mercapto acids. (Lignin research, XVII).]** *Arkiv för Kemi, Mineralogi och Geologi, Stockholm* 24*a* (29), 1947 (1–11). 9 refs. [G.g.] O.R.S.

Lignin determination with H_2SO_4 showed that the triploid giant Aspen has a lower lignin content than the normal diploid Aspen. Extraction with thioglycolic and thiohydracrylic acids gave lignothioglycolic and lignothiohydracrylic acids respectively; again the yields were lower from the triploid than from the diploid Aspen. Aspen appears to contain several sorts of lignin, those with the highest MeO content being most easily attacked and dissolved by the mercapto acids.

1879. BAILEY, A. **Solubility and extraction studies of lignin.** *Paper Industry and Paper World, Mount Morris, Ill.* 30 (8), 1948 (1196–9). [University of Washington.] L.S.

Solubility and extraction studies were made with 31 solvents on 4 lignin preparations: a lignin from Aspen (*Populus tremuloides*) and one from Western Hemlock (*Tsuga heterophylla*) prepared in the laboratory by different methods, a commercial alkali lignin from mixed hardwoods (meadol) and a commercial sulphite waste liquor from Western Hemlock, evaporated under a vacuum. A list of the solvents which effected clear-cut extraction into soluble and insoluble fractions is given for each lignin. The different fluorescence and diffusion rates of the soluble and insoluble fractions suggest that all the lignins studied are mixtures, not pure substances. It is thought that the solvent-extraction method of separating lignin rapidly and easily into 2 fractions should find wide use in the study of lignin chemistry, and in analytical experiments dealing with lignin purity and heterogeneity.

1880. **Methanol extractions of lignin.** *Rep. For. Prod. Aust. 1948–9*, 1949 (11–2).

Methanol extractions at 150° C. of young *Eucalyptus regnans* sawdust have shown that about 87% of the original Klason lignin is removed during a 500-hour extraction. An equation derived from this and from previous results indicates that it is possible to extract nearly all the lignin in a finite time. [Cf. *For. Abstr.* 10 (No. 1878), 11 (No. 2023).]

1881. FREUDENBERG, K. Die Sauerstoffbilanz des Lignins. **[The oxygen balance of lignin.]** *Papier, Darmstadt* 1 (11/12), 1947 (209). [G.] B.P.I.R.A.

1882. BELL, A., and WRIGHT, G. F. **The isobutyl group in Spruce and Birch lignins.** *Canad. J. Res.* 27*B* (6), 1949 (572–9). 11 refs. P.R.

1883. BELL, A., and WRIGHT, G. F. **The carbonyl group in Birch lignin.** *Canad. J. Res.* 27*B* (6), 1949 (565–71). 4 refs. P.R.

1884. PAULY, H. Scheidung von Lignin-Komponenten, II Mitteil. Addukte mit Maleinsäureanhydrid. **[Separation of lignin components. II. Adducts with maleic anhydride.]** *Chem. Ber.* 81 (5), 1948 (392–9). 29 refs. [G.g.] O.R.S.

1885. JAYME, G., and MOHRBERG, W. Quellungsmessungen an ligninhaltiger Holocellulosen. **[Swelling measurements on holocelluloses containing lignin.]** *Papier, Darmstadt* 3 (9/10), 1949 (153–9). 16 refs. [G.g.] L.S.

1886. MEYER, K. H., STUDER, M., and WYK, A. J. A. VAN DER. **Constitution of 'pure' cellulose.** *Nature, Lond.* 164 (4175), 1949 (786–7).

The existence of the B1–4 polyglucosan has been demonstrated, and since the greater part of cellulose fibres (both cotton and wood) consists of it, it is proposed to term this polysaccharide 'pure cellulose'.

1887. BROWNING, B. L. **Apparatus for determination of polyuronide carboxyl [in wood and other fibrous materials].** *Tappi, Easton, Pa.* 32 (3), 1949 (119–20). 4 refs. [Institute of Paper Chemistry, Appleton, Wis.] L.S.

1888. **[Wood chemistry of *Morus excelsa*.]** *Rep. colon. Res. Comm., Lond. 1948–9*, 1949 (44–5).

An amorphous saponin has been isolated by extraction from the wood of *Morus excelsa*. In most of the samples of wood examined the saponin is present to the extent of 8–10% but occasionally the saponin content is only 3·5%. On hydrolysis the saponin yields glucose and xylose together with a crystalline sapogenin. The latter may be of the steroid type having the formula $C_{23}H_{44}O_3$, and is being studied further, since it may prove to have therapeutic value.

1889. UO, H., FUKUSHIMA, B., and KONDO, T. **Substances in tree trunks reacting positively with magnesium and hydrochloric acid. I. Katsuranin, a new flavanol [from Katsura (*Cercidiphyllum japonicum*)].** *Journal of the Agricultural Chemical Society of Japan, Tokyo* 19, 1943 (467–77). *Chem. Abstr.* 42 (14), 1948 (5088). P.R.

1890. ANET, F. A. L., BLANKS, F. R., and HUGHES, G. K. **The chemical constituents of Australian *Flindersia* species. 1. Collinin, 7-geranoxy-8-methoxycoumarin.** *Aust. J. sci. Res.* 2*A* (1), 1949 (127–31). 10 refs. [Dept. of Chemistry, University of Sydney.] P.R.

Collinin, a new coumarin, has been isolated from the bark of *Flindersia collina* Bail. and shown to be 7-geranoxy-8-methoxycoumarin. *Authors' summary.*

1891. **Chemical investigations into the cambial and neighbouring zones of *Eucalyptus regnans*.** *Rep. For. Prod. Aust., 1948–9*, 1949 (14).

The cambial zone is relatively rich in nitrogenous materials, containing *ca.* 13 and 1% respectively of protein and nitrate. The differentiated wood tissues contain small amounts of nitrogenous materials whereas the other zones contain 2 or 3% protein. The sugar distribution is similar to that of the proteins. The tannin content of the zones decreases progressively from a value of 2–3% in the outer bark to 0·04% in the sapwood and then rises to 0·4% in the heartwood. [Cf. *For. Abstr.* 10 (No. 1878).]

1892. GRIFFIOEN, K. Bevat djeungdjinghout een giftige en irriterende stof? **[Does *Albizzia falcata* contain a poisonous, irritant substance?]** *Tectona* 39 (2), 1949 (175–7). [Du.e.]

The wood of *Albizzia falcata*, like that of *A. procera* ('Sneezewood') contains a substance which has an irritating action on the mucous membranes. Laboratory tests showed that extractives of the wood had an inhibiting effect on the growth of *Lentinus sajor-caju, Polystictus sanguineus, P. hirsutus* and *Polyporus cervinogilvus* on culture media.

1893. NEUHAUS, J. W. G., and REUTER, F. H. **A note on some minor constituents of the wood oil of *Callitris glauca*.** *Journal and Proceedings of the Australian Chemical Institute, Melbourne* 15 (6), 1948 (185–9). 9 refs. L.S.

1894. STANLEY, P., and TRIKOJUS, V. M. **The occurrence of β-carotene and 'phytofluene' in the wood of *Acacia acuminata*.** *Aust. J. sci. Res.* 2*A* (1), 1949 (132–8). 10 refs. P.R.

The separation from extracts of *A. acuminata*, by chromatographic procedures, of β-carotene and a colourless fluorescent oil of similar adsorption properties is described. On the basis of its absorption spectrum and other properties, the fluorescent oil is considered to be closely related to and possibly identical with the colourless carotenoid, phytofluene. *Authors' summary.*

1895. **Siliceous inclusions in timber.** *Rep. For. Prod. Aust. 1948–9*, 1949 (10–1).

In a survey of timbers in the south-west Pacific and other areas, 400 timbers belonging to 30 families have been found to contain siliceous inclusions. Corpuscular aggregates of SiO_2 occur when the silica content of the timber, based on the dry weight, exceeds 0·05%. The presence of SiO_2 appears to be

related not only to resistance to attack by shipworms, but also to working qualities. In addition, the presence or absence of SiO_2 deposits, easily recognizable microscopically because of their characteristic optical properties, is of considerable value in identification. [Cf. *For. Abstr.* 8 (No. 1820); 10 (Nos. 295 and 852); 11 (No. 364).]

31.4. *Durability. Decomposition*

31.42. *Attack by Plant Organisms*

See also *For. Abstr.* 11 (Nos. 1679, 1892, 2061–4, 2225).

1896. FÅHRAEUS, G. ***Agrobacterium radiobacter* Conn as a symbiont in cellulose decomposition.** *K. LantbrHögsk. Ann., Uppsala* 16, 1949 (159–66). 22 refs. O.B.D. [E.]

Describes experiments to investigate the stimulation of cellulose decomposition in *Cytophaga* cultures by means of *Agrobacterium radiobacter*. It was confirmed that volatile acids are formed in *Cytophaga* cultures and that they have an adverse effect on the growth of the bacteria, thus reducing the rate of cellulose decomposition. *A. radiobacter* utilizes these acids and brings about an increase in cellulose decomposition.

1897. FÅHRAEUS, G. **On the oxidation of phenolic compounds by wood-rotting fungi.** *K. LantbrHögsk. Ann., Uppsala* 16, 1949 (618–29). 25 refs. [E.] O.B.D.

Describes investigations of the oxidizing action of some wood-rotting fungi on (1) some relatively simple phenolic compounds, (2) some rather high-molecular substances containing phenolic groups, and (3) several aromatic amines. It was confirmed that the lignin-decomposing white-rot fungi give dark-coloured oxidation zones on phenols while the brown-rot fungi do not. Some of the substances were selected for experiments aimed at isolating lignin-decomposing fungi from soil. Mycelia were isolated from soil inoculation of malt agar plates which had 0·1 or 0·05% tannic acid, and one of the fungi obtained was found to decompose lignin, though rather weakly. A particularly interesting compound was α-naphthol, which, apart from the very intense colour of its oxidation, inhibits the growth of wood-rotting fungi only very slightly, but that of all other fungi completely.

1898. SUOLAHTI, O. Lahon ja terveen puun kastuminen ja kuivuminen. **[The soaking and drying of sound and decayed woods.]** *Tiedoitus, Valtion teknillinen Tutkimuslaitos, Helsinki* No. 65, 1948. pp. 19. [Fi.e.] P.R.

Results obtained from laboratory tests show: (1) that decayed wood in air with a relative humidity of 100% absorbs moisture more rapidly than sound wood at first (6–8 days), but that there is no significant difference later on; (2) that rotten wood submerged in water absorbs moisture far more rapidly than sound wood, and that the rate increases markedly with the stage of decay; (3) that there is no substantial difference in the drying rates of sound and rotten wood; and (4) that the live mycelia in rotten wood do not slow down the drying of the wood in conditions unfavourable to their growth. Further experimental work is considered necessary. *From author's summary.*

31.43. Attack by Animal Organisms

See also *For. Abstr.* 11 (Nos. 1895, 2088–93, 2095, 2322).

1899. BECKER, G. **Ecological and physiological researches on the wood-destroying larvae of *Anobium punctatum* de Geer.** *Zeitschrift für Morphologie und Ökologie der Tiere, Berlin* 39, 1942 (98–152). *Chem. Abstr.* 42 (14), 1948 (5126). P.R.

The larvae attacked all species of European woods tested; the growth rate is, however, influenced by the diet. In Pine, Lime, and Poplar there is a nutritional gradient from the outside to the inside of the stem, which is apparently lacking in Maple and Alder. Carbohydrates are the most important larval food. Addition of hexoses accelerates growth while pentoses are apparently indigestible. Fats and oil in high concentrations limit growth; addition of peptone and diastase and peptone preparations increases it. Previous attack by yeast, or addition of an aqueous solution of yeasts that attack wood, increases the food value of wood for the larvae. Soaking wood in water or boiling it in dilute H_2SO_4 decreases its food value.

1900. BECKER, G. Ergebnisse der Hausbockforschung. **[Results of investigations**

on the house longhorn beetle.] *Anz. Schädlingsk.* 22 (7), 1949 (97–102). 92 refs. [G.]

A review of the life history and habits of *Hylotrupes bajulus*, based on world literature.

1901. JACQUIOT, C. Note sur la qualité des bois 'bostrychés'. [**Note on the quality of wood attacked by bark beetles.**] *Rev. Bois Appl.* 4 (9/10), 1949 (37). [F.]

Emphasizes that bark beetles do not themselves damage timber, but that they carry the spores of fungi, particularly of *Ceratostomella*, which may in extreme cases reduce the mechanical, and especially the impact, strength of timber.

1902. TOOKE, F. G. C. **Beetles injurious to timber in South Africa: a study of their biology, prevention and control.** *Sci. Bull. Dep. Agric. S. Afr.* No. 293, 1949. pp. 95 + 18 photos, 22 drawings. 62 refs. (*Entomology Series* No. 28.) P.R.

Contains sections on: the occurrence, description and life history, timbers attacked and methods of control, for beetles attacking green or freshly felled wood (Scolytidae and Platypodidae), beetles attacking seasoned wood only (Bostrichidae, Lyctidae, Anobiidae and Cerambycidae) and lesser known timber beetles; and methods of prevention and eradication. Includes keys to common insect pests of timbers in S. Africa, and to the type of insect damage to timber, and quotes the regulations for combating and preventing the spread of certain timber insect pests. [Cf. *For. Abstr.* 8 (No. 1965).]

1903. **[Girdling for starch depletion.]** *For. Res. India Burma 1946–7*, [1949?] (29).

All *Terminalia tomentosa* trees became free from starch in 3½ years from the time of girdling. Most of them showed no starch after 2 years. *Anogeissus latifolia* and *Eugenia jambolana* gave erratic results, some trees being completely free of starch after 3 years and others not.

1904. **Borers in newly felled timber.** *For. Res. India Burma 1946–7*, [1949?] (75–80).

An investigation into borers of newly felled timbers of *Vateria indica*, *Dipterocarpus indicus*, *Terminalia belerica* and *Polyalthia coffeoides* was made by the Madras Forest Department. Details of methods and results are given. The following conclusions are reached:—(1) Logs of the first 3 species must be barked not later than 2 months after felling, and logs of *P. coffeoides* within a month of felling. Logs kept with bark intact beyond these periods are liable to severe cerambycid attack. (2) Barking should be done outside the forest and the barked logs stored in the open to minimize damage by pinhole borers, which is greatly increased if the logs are kept under forest shade. (3) Keeping the bark intact for 2 months and storing preferably in shade, reduces attack by Bostrichidae on *V. indica* and *T. belerica* but makes little difference to *D. indicus*. (4) Bostrichid attack was confined to *V. indica* felled Oct.–Feb., *D. indicus* Aug.–Sept., *T. belerica* and *P. coffeoides* Oct.–March. This immunity lasted for a year, and if it is found to be permanent, then certain well defined safe felling periods against bostrichid attack are indicated for each species. (5) Timber sawn immediately after felling is liable to serious bostrichid attack; there are indications that the attack is considerably reduced if the timber is kept in log form for about 3 months before sawing. (6) The conclusions refer only to south India, and would have to be modified for other regions.

1905. **Borers of *Boswellia serrata* (Salai).** *For. Res. India Burma 1946–7*, [1949?] (80–1).

Logs felled and barked in February, May, August and November were brought to Dehra Dun at the time of felling, and sawn into planks 1 in. thick (2 logs soon after felling and 2 each after storage in log form for periods of 1, 2, and 3 months respectively). The results so far are that planks from logs felled in February and May and converted immediately were liable to serious bostrichid attack, but those sawn from logs stored for 2–3 months after felling show no attack beyond what had taken place in log form, viz. in the outer inch or so of the log. Planks from August and November fellings have so far remained practically free from bostrichid attack. Logs stored in the shed were liable to a certain amount of attack by pinhole borer, but not logs stored in the open.

1906. **Water soaking of planks against insect attack.** *For. Res. India Burma 1946–7*, [1949?] (81).

Freshly sawn planks, 1 in. thick, of *Mangifera indica* and *Albizzia procera*, were immersed in water at Dehra Dun in April 1945 and taken out for exposure to borer attack in batches, at fortnightly intervals for *M. indica* and monthly for *A. procera*, up to 12 weeks, to determine the effect of different periods of water-soaking on their liability to insect attack. The results up to April 1947 were as follows:—*M. indica*: the planks taken out of water after 12 weeks have so far remained free except one plank showing negligible *Lyctus* and *Heterobostrychus* attack. The control planks (not water-soaked) and those submerged for periods up to 10 weeks have shown unexpectedly light bostrichid attack. *A. procera*: planks exposed to attack after 2 and 3 months of immersion in water have remained free from insect attack. The controls were heavily attacked by Bostrichidae.

The initial starch content of the planks was high. No appreciable depletion of starch occurred during water-soaking, and the protective effect of soaking was due to leaching out of sugars. [Cf. *For. Abstr.* 10 (No. 1953).]

1907. **Use of DDT against wood borers.** *For. Res. India Burma 1946–7*, [1949?] (81–2).

Preliminary experiments using freshly felled billets (6 in. long and 3–4 in. in girth) of *Albizzia procera* were made to test the effect of DDT in 1% and 2% benzene emulsions and 1% and 2% mustard oil emulsions against borer attack. After one year's exposure it was found that both emulsions of 2% DDT were completely effective. The 1% emulsions were only partially effective. All the controls were attacked by Bostrichidae.

1908. PLANK, H. K. **Control of the Bamboo powder-post beetle in Puerto Rico.** *Trop. Agriculture Trin.* 26 (1/6), 1949 (64–7). 13 refs.

The greatest obstacle to the full utilization of many of the 35 species and varieties of Bamboo introduced and established in Puerto Rico has been the early infestation of the harvested culms by the Bamboo powder-post beetle (*Dinoderus minutus*). Systematic testing has so far shown the 1st-year growth of 8 species to be considerably resistant to attack. Resistance was associated with lack of starch, low moisture content and high specific gravity. Resistance increased with air drying. Culms should be harvested at the resistant age and dried in the field. DDT, brushed on in a 5% solution, has given better results than any other material so far tried for preventing infestation in storage immediately after harvest. The residual protection afforded by DDT appears to be of sufficient duration to carry the culms through this critical period when liability to infestation is greatest.

1909. B[ROWNE], F. G. **Creosote and ambrosia beetles.** *Malay. Forester* 12 (3), 1949 (142).

Tests at Kepong do not confirm the claim that logs can be protected from ambrosia beetles by spraying with a mixture of solignum and diesel oil. Both solignum and creosote, whether mixed with diesel oil or not, attract ambrosia beetles.

31.8. *Quality and Defects of Timber*

See also *For. Abstr.* 11 (No. 1852).

1910. Ferrodétecteur type 50. **[Ferrodetector type 50.]** *Rev. Bois Appl.* 4 (11), 1949 (36). [F.]

Describes a portable metal-detector of great sensitivity developed by the Office National d'Études et Recherches Aéronautiques.

1911. BOYD, J. **Growth stresses in trees.** *For. Prod. News Lett. C.S.I.R. Aust.* No. 173, 1949 (2–4).

Discusses the types of stresses (longitudinal, circumferential and radial) found in newly felled timber, and methods of determining stress values.

1912. **Timber mechanics: growth stresses in trees.** *Rep. For. Prod. Aust. 1948–9*, 1949 (26–7).

In Eucalypts, the only timbers so far examined, radial stresses are not serious in their effects. Ring or circumferential stresses are compressive at the periphery and tensile, increasing in intensity, towards the pith. The longitudinal stresses are tensile at the periphery and compressive and increasing towards the heart; the tensile stresses appear to be about 150 lb./sq. in. and the compressive stresses may theoretically exceed those determined in standard laboratory tests. They are probably responsible for brittle heart, and laboratory

tests are being carried out to stimulate the production of brittle heart. When a tree is cross-cut, the longitudinal stresses are released at the cross-cut face and there is an appreciable tensile effect in the transverse plane which, with the tensile ring stress, is often, perhaps always with the Eucalypts, sufficient to cause heart-checking.

32. HARVESTING OF WOOD. LOGGING

See also *For. Abstr.* 11 (Nos. 1739–41, 1903–9, 2040, 2056, 2325).

1913. WACKERMAN, A. E. **Harvesting timber crops.** McGraw Hill Book Co., Inc., New York, Toronto, London. 1949. pp. xii + 437. 26 refs. Price: $5.00.

The book aims at describing and discussing the principles involved in logging operations in the N. American continent with special emphasis on forestry aspects. Detailed descriptions of saws and transport equipment have been omitted because rapid changes in the models constantly take place. The subject is treated under the following heads: (1) Preliminary considerations i.e. the correlation of timber cropping to other forest values, labour aspects, the history and present situation of American forest industries, the origin of modern logging methods, planning. (2) Preparation of trees for removal; a section including chapters on selection of trees for felling, felling operations, cross-cutting, other kinds of preliminary conversion, tools. (3) Transport i.e. bunching, skidding, loading and removal of products from the forest. (4) Organization and control of operations, under which head are grouped chapters on measurement of felled timber, costs and records, and various regional logging practices.

1914. **Commemorating fifty years of service.** *Timberman* 50 (12), 1949. pp. 276.

This 50th anniversary number of *The Timberman* contains a number of well illustrated articles tracing the development of logging methods and equipment in the U.S.A. during the 50 years of the journal's life.

1915. JALAVA, M. **Improvement of efficiency in logging [in Finland].** *Abstr.* in *Bull. World For. Congr.* No. 7, 1949 (9).

Before the war, felling, hauling, floating, and other logging expenses constituted *ca.* 30%, and stumpage price *ca.* 70% of the cost price of sawlogs at sawmills in Finland. Now the ratio is reversed. The writer considers that not much can be done to remedy this state of affairs, the scope of mechanization being very limited.

1916. KARPOV, S. G. Kruglogodovaya ritmichnaya rabota—stil' Kovrovskogo lespromkhoza. **[Rhythmic, year-round work —a feature in the Kovrovsk Lespromkhoz.]** *Lesn. Prom.* 1949 (5), (6–8). [Russ.]

The year-round work of this logging enterprise in Gor'ki Province is based on the use of VAKOPP mass-produced power saws, mobile generating stations (PES-12 and PES-60 types), KT-12 skidding tractors, and especially narrow-gauge railway lines for extraction (average rail trip 56 km.). Extraction is more efficient in summer, as the train loads can exceed the winter loads by 15–20%, and there is not the waste of time in clearing snow from the line. Floods stop railway traffic for a month in the spring, but the time is used to repair the line. A special gang is kept to lay temporary spur lines to logging sites. In winter these lines are laid on a snow foundation, with ordinary 2-m. fuelwood logs as sleepers. The work is planned so that all the timber is extracted before the thaws. Where the line is to be kept open for summer work, stump-grubbing and levelling must precede laying of the line. Stumps are blasted with ammonal, use of which halves the cost of hand grubbing and decreases the expenditure of labour to one-tenth.

1917. ULLÉN, G. Redogörelse för några arbetsstudier vid Kungl. Skogshögskolans övningar i arbetslära sommaren 1948. **[Report on some work studies made during the practical exercises in this subject of the Swedish College of Forestry, summer 1948.]** *Norrlands SkogsvFörb. Tidskr.* 1948 (3), (301–15). [Sw.]

Reports on time studies of the cutting (felling, cross-cutting, barking and stacking) of wood for charcoaling during a thinning of 30-year-old Scots Pine, with some Norway Spruce and Birch, in Bjurfors Crown Park. The chief aim was to test the fairness of the Swedish custom of paying the cutters by the stacked unit, without respect to the diameter of the billets, and to examine the variation with tree diameter of cutting time and costs. Results,

which are given in a table and graphs, showed that (1) payment by the stack is fair, provided that the degree of strip-barking (number of strips barked per billet) is directly proportional to the top diam. of the billet; (2) cutting time and costs were considerably greater for small than for larger-diameter material, a fact to be remembered in valuing standing forest and calculating the smallest merchantable dimensions.

A comparison was also made of a rubber-tyred cart of short wheel-base and the traditional charcoal-wood sledge, for extracting pulpwood by horse over bare ground to a motor road. Extraction by cart was the more efficient method for wood of small diameter no matter what the distance to the road, and for the larger wood it became the more efficient at distances from the road of 100–150 m.

32.1. *Marking of Trees and Coupes*

1918. James, N. D. G. **[A French timber scribe.]** *J. Land Agents' Soc.* 48 (10), 1949 (349–50).

The scribe, which is illustrated in the closed position, half-open, and ready for use, has a knuckle protector and a wide cutting head.

32.2. *Felling and Related Operations*

1919. Cox, M. B. **Seasonal effect on power-saw operation in removing brush and trees.** *Res. Rep. 5th ann. Nth. Cent. Weed Control Conf. 1948*, Sect. VI. O.R.E.

Results of seasonal cutting of brush and small trees with a small portable power saw in north central U.S.A., indicate that the operation takes longer in winter than in spring or summer. Man-hours/1,000 trees for the different seasons were:—winter 15·4, spring 7·4, and summer 8·0. Cutting was more difficult in the dormant stage of the tree, and saw-blades remained sharper and lasted longer during the growing season. Winter cutting also requires that saw teeth should be more carefully shaped and maintained.

1920. Hebblethwaite, C. H. **The application of power chain saws [for felling and cross-cutting, and for further conversion].** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 174, 1949 (4).

1921. Carpelan, G. Motorsågar och deras användning i svenskt skogsbruk: praktiska erfarenheter och resultat av undersökningar utförda hos S.D.A. **[Power saws and their use in Swedish forestry: practical experience and results from investigations carried out by the Job Study Department of the Forest Employer's Association and the Swedish Forest Service.]** *Norrlands SkogsvFörb. Tidskr.* 1948 (3), (227–90). 31 refs. [Sw.e.] (*Meddelande från Föreningen Skogsarbetens och Kungl. Domänstyrelsens Arbetsstudieavdelning* (S.D.A.) No. 32.)

Briefly reviews the history of power saws and the general conditions under which they compete with hand saws in logging work. Under present Swedish conditions chain saws are considered the only suitable type, and of these the 1-man models are thought to be best suited to normal logging conditions there. These models, however, have only recently become available, and the studies which form the main part of this paper are of 2-man chain saws of the 'sword' type, for felling only. Results of time studies and cost calculations are given in detail, tables and graphs being provided with English as well as Swedish legends, and further sections discuss problems of job organization, technique of work, accident risks, training of operators, wage-fixing etc. [A short summary of the same investigations has also appeared in a Finnish journal—Cf. *For. Abstr.* 11 (No. 1148).]

1922. Benić, R. Motorne lančane pile: prilog poznavanju rada i efekta pila 'Teles' i 'Mercury' (prethodni izvještaj). **[Motor chain-saws: the performance of the Teles and Mercury (preliminary report).]** *Šum. List* 72 (8), 1948 (249–61). 6 refs. [Croat.]

First tests of these 2 types, mainly on Oak and Ash, rated them about equal. The Teles' 10% higher rate of performance is offset by the Mercury's 4% longer effective working time, since it is lighter and less tiring to operate. For best results with chain saws there should be 3 chains to each saw, one for the morning, one for the afternoon, and one in reserve. Chain-saw productivity is 75% and the financial gain 16% above manual sawing, but with improved organization and increased operative skill an economic improvement well over 100% is attainable. In the lowlands, and when confined to felling work, the efficiency of

chain saws is very high, always provided the operators are well trained and the servicing adequate. Their efficiency in mountainous areas and for the felling of other species, such as Beech and Fir, must await the results of further tests.

1923. VEKSHEGONOV, V. Y., and PAVLOV, E. A. **Electric saws of increased frequency current and their industrial and technological characteristics.** *Transl. For. Prod. Aust.* 1949. pp. 7. Transl. by M. Slade from *Lesnaya Prom.* 1948 (2), (20–3). [*For. Abstr.* 10 (No. 1145)]. P.R.

1924. MIRONOV, T. **Testing the electric saw of the type EPKh-3.** *Transl. For. Prod. Aust.* 1949. pp. 4. Transl. by E. Roxon from *Lesnaya Prom.* 1948 (10), (7–8). [*For. Abstr.* 10 (No. 2658).] P.R.

1925. RUPF, H. **The DuD-plane-tooth saw.** *Transl. For. Prod. Aust.* 1949. pp. 7. Transl. by W. Kaumann from *Forst und Holz* 4 (5), 1949 (62–4). P.R.

1926. HALE, J. D., and MCINTOSH, D. C. **Treatment of pulp trees with toxic chemicals to facilitate bark removal and reduce weight.** *B.C. Lumberm.* 33 (10), 1949 (61–2, 82).

A brief summary of work done by the Forest Products Laboratories of Canada, together with observations on the effects on wood quality. Trees treated and left standing until October can be peeled with ease. No significant drying effect has been observed in hardwood species, but appreciable reductions in weight took place when *Pinus banksiana*, *Abies balsamea* and *Thuja occidentalis* were felled in the autumn, after treatment in June and July. Arsenic treatment keeps trees fairly free from bark pests, but stain and insect attack on sapwood was not avoided with the other chemicals used. The most effective chemical discovered so far is arsenic, but it is not ideal for use in the forest because of its potential danger to workers and animal life. A petrol-powered, deep-cutting tool for girdling has recently been developed. [Cf. *For. Abstr.* 11 (No. 1151).]

1927. STORVIKS SULFIT AKTIEBOLAG, OCKELBO. Sätt och anordning för barkning av rundvirke. **[Method and equipment for barking logs.]** *Swed. Patent* No. 126,001, Sept. 6, 1949. [Sw.] *Abstr.* in *Svensk Papp Tidn.* 52 (22), 1949 (567). P.R.

The barking knife is controlled by a photo-electric cell which brings it in contact with the log when the latter is covered with bark or is dark in colour, and withdraws it when the log is free of bark and white.

1928. **New method of barking peeler logs.** *Lumberm.* 76 (9), 1949 (63).

At the MacMillan plywood plant near Vancouver, B.C., a new method of removing bark from veneer logs has been evolved. Instead of being slashed off by knives, the bark is removed under pressure from a steel bar, pressure being exerted by means of a pneumatic piston. In this way practically all damage to usable wood is avoided.

1929. SWIFT, F. H. (to Crown Zellerbach Corp., San Francisco). **Hydraulic type log de-barker having plural log-rotating chucks independently revolvable about a common axis.** *U.S. Patent* No. 2,453,947, [1948]. *Paper Tr. J.* 128 (17), 1949 (26). P.R.

1930. ROBERTSON, C. J. **Impact type log peeler.** *U.S. Patent* No. 2,461,924, Feb. 15, 1949. *Abstr.* in *Paper Tr. J.* 129 (6), 1949 (44). P.R.

1931. COLLIER, R. D. **Splitting large bolts with 'guns'.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 67 (B–7–b), 1949. pp. 2.

Describes an economical device used for splitting large pulpwood bolts in the forest. It consists of a single piece of steel (weight 7 lb.) chambered for a charge of black powder, which is hammered about ½ in. into the bolt, and there fired by a time fuse. It is manufactured by the Lindberg Machine Shop, R.F.D. 1, Johnsonburg, Pa., U.S.A.

32.29. Clearance of Felling Site. Stump Removal. Slash Disposal

1932. GUYOT, H. Utilisation des explosifs en agriculture. **[Use of explosives in agriculture.]** *Fruits d'Outre-Mer, Paris* 2 (4; 8), 1947 (114–8; 255–61). [F.] D.S.I.R.

Practical information on types of explosive and accessories necessary for their use, with illustrated descriptions of methods of blowing up tree stumps.

1933. KOROLEFF, A. **Re portable slash and wood chippers.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* Nos. 71 (B–11), 72 (B–11), 1949. pp. 4 + 3.

Further data on the performance of 3 types of chipper, supplementary to a previous article. [Cf. *For. Abstr.* 11 (No. 1153).]

32.8. *Grading and Storage of Wood in the Rough*

See *For. Abstr.* 11 (Nos. 1904–9).

32.9. *Transport*

See also *For. Abstr.* 11 (Nos. 1913–7).

1934. WILLARD, J. A. **Economics of wood handling.** *Tappi, Easton, Pa.* 32 (1), 1949 (6–10). L.S.

Compares the relative economic value of different methods used in Sweden and U.S.A. of handling pulpwood during transport from the logging site and in the mill.

1935. KOSKI, O. O. **Pulpwood handling in the Lake States.** *Paper Tr. J.* 129 (15), 1949 (35–8). P.R.

32.91. Land Transport

1936. ZASADA, Z. A. **Cost of skidding Jack Pine [by horse, in Minnesota].** *Tech. Note Lake St. For. Exp. Sta.* No. 322, 1949. p. 1.

1937. **[A short illustrated review of the] evolution of the logging arch [in the U.S.A.].]** *Timberman* 50 (12), 1949 (57–62).

1938. OVERBEEK, J. T. Iets over mechanisatie in de indonesische bosbouw. **[A note on mechanization in Indonesian forestry.]** *Tectona* 39 (2), 1949 (135–50). [Du.e.]

An experiment in mechanized logging was effected on the Island of Morotai after the war by the use of existing roads and some old army material, and the totally untrained native population. The results were rather encouraging when compared with the cost of logging in other, non-mechanized areas. Working with a skidding unit of 4 tractors, production should be *ca.* 1,200 cu.m./month. This requires, for felling and skidding, some 20 men compared with 120 in a non-mechanized operation.

1939. FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Powered trailer for wheeled tractor.** *Rep. U.S. For. Prod. Lab., Madison* No. R1637–35, 1949. pp. 2. P.R.

Power is carried to the trailer wheels by the tractor motor through a conventional power take-off. Power is thus distributed to more wheels, lessening the danger of slipping on soft ground. The trailer is coupled to the tractor in a few minutes. Loads averaging 500 ft. of logs are hauled over ground where no lorry can go. The coupling and power-transfer unit are shown in a photograph.

1940. **Special log cart used in swamps.** *Sth. Lumberm.* 179 (2245), 1949 (36).

A special device for use in hauling logs in swampy areas has been created by the Camp Manufacturing Co. Inc., Franklin, Va. Trailer frames are equipped with front and rear crawler tracks, the rear ones being interchangeable with a pair of pneumatic-tyred rear axles. The loaded trailer is hauled out of the swamp while equipped with the crawler tracks. On the main highway the rear tracks are removed and replaced by the pneumatic-tyred axles for quick haulage to the sawmill.

1941. KOVACSOVICS, K. Un nouveau procédé de débardage en Autriche. **[A new method of hauling timber in Austria.]** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (26–8). [F.]

The Steyr-Daimler-Puch-Werke of Austria have added to their diesel tractor (2-cylinder, 26-h.p., type 180) a trailer with a universal joint. The whole outfit is very powerful and can be driven on public roads as well as operating in rough terrain. The wheelbase of the tractor measures 1,300 mm., and its weight is 1,800 kg. The new trailer is the front axle of a lorry, attached to the tractor by a jointed shaft, its wheels being driven by transmission from the rear axle of the tractor. The trailer is controlled by a pneumatic brake connected with the mechanical brake of the tractor. Downhill, the braking action of the motor is transmitted to the trailer. A great advantage is the ease of movement ensured by the flexible coupling between the two driving axles. On the level, a speed of 25 km./hr. can be attained, and in climbing, the tractive power equals that of a caterpillar tractor. It can haul a 5-ton load

up and down a 20% slope even on a bad road, and take logs up to 16 m. long.

1942. Putkisto, K. Eräs pankko-sivutukirakennelma. **[A bunk and side-strut construction.]** *Metsät. Aikak.* 1948 (7/8), (212–3). [Fi.]

A bunk and side-strut design providing uncommonly rapid and safe unloading is the Swedish 'Dunderbanken' (Gällivare Metallindustri AB) of U-shaped steel. The bunks proper are of either fixed or extensible type, and on trailer sledges or tractors have additional welded girders. The side-struts, also of U-shaped steel, are made in 3 sections and their height is adjustable to that of the load, which is contained by chains linked to the topmost section of each strut by a 'bear' chain-lock. To unload, a safety catch at sections 1 and 2 and a safety socket below (on the bunk?) are moved, upon which the release mechanism, actuated by a pull handle on the opposite side of the lorry, allows the lowest strut section to break away and drop outwards and downwards (hinged) under the side thrust of the load. The two upper sections remain hanging from the chain, the logs rolling off under them. Advantages claimed for this device are: (1) side-struts sustain no damage during unloading; (2) they cannot get buried under the falling logs, and time is thus saved; (3) unloading accidents are minimized. The general action of the mechanism is illustrated in diagrams and photographs.

1943. Kantola, M. Uutta tukkien rekeenkuormauksesta. **[New features in loading timber logs into a sleigh.]** *Metsät. Aikak.* 1948 (10), (279). [Fi.]

The writer describes the activities of the Työtehoseura, the Association for Work Efficiency Improvement, in standardizing forest implements and equipment; and in particular, recent steps to introduce into general use sleigh runners with a standard interval of 61 cm. (from inside edges). The Association's test model sleigh, incorporating new devices for, e.g. quick unloading is also briefly described.

1944. Khan, A. **The Nandhaur Valley tramway.** *Indian For.* 74 (5), 1948 (195–203 + 2 photos).

The tramway is 15½ miles long and was completed in 1926 for the purpose of transporting forest products. The paper describes its working and management. It has brought in an annual surplus of Rs. 32,500.

32.92-4. Water Transport

See also *For. Abstr.* 11 (Nos. 1952, 1957).

1945. **Floating as a form of long-distance transport in Finland.** *Abstr.* in *Bull. World For. Congr.* No. 7, 1949 (10–1).

1946. Maakonen, A. Uitto Työtehon Suurnäyttelyssä. **[Floating at the Work Efficiency Exhibition.]** *Metsät. Aikak.* 1948(10), 287–8). [Fi.]

A general appreciation of the importance of floating problems and the general view which this exhibition gives of them.

1947. Järvelä, Y. Uittohäviö ja sen pienentämismahdollisuudet. **[Losses by sinking and possibilities of reducing them.]** *Metsät. Aikak.* 1948 (6), (183–6). [Fi.]

Formerly some 2–3% of the annual cut was lost in floating but with the extraction of younger trees and longer floating distances, the annual loss is now estimated at some 5%, valued at over 600 million marks. In view of this huge loss, the writer urges a comprehensive investigation into ways and means of reducing it.

1948. Chebomarev, I. K., and Zlobin, N. A. Za tekhnicheski progress na kamskom splave. **[Technical progress in timber rafting on the R. Kama.]** *Lesn. Prom.* 1949 (5), (15–7). [Russ.]

Discusses in general terms the chief means of increasing still further the output and efficiency of timber rafting and floating operations on the Kama and its tributaries. Two of the foremost needs are maximum use of the high water in spring (summer and autumn rafting costs 30–100% more) for mixed rafting and loose floating, and a considerable increase of winter rafting, which is also cheaper than summer rafting and would be still more so if mechanized. The needs for greater efficiency in sorting-works, for engineering improvements to the rivers concerned, improvement of equipment and increased mechanization, are also emphasized.

1949. ORLOV, N. N. Osvoenie malýkh rek. **[Utilization of small rivers.]** *Lesn. Prom.* 1949 (5), (12–5). [Russ.]

Draws attention to the cheapness of timber-floating in Russia and to the opportunities for greater use of the smaller rivers at the cost of relatively simple improvement works [cf. *For. Abstr.* 8 (No. 340)]. Discusses the types and transport facilities of logging enterprises that might benefit from a change to floating as a major means of timber extraction; classifies small, 'floatable' rivers into 4 types from the point of view of improvements needed; and gives a few examples, with diagrams of the minimum improvement works needed to bring some typical stretches of river into service. Such schemes, it is claimed, can repay the capital costs in 1–2½ years of operation.

32.95. Ropeways. Cableways

1950. SCHMID. Das Drahtseil im Dienste der Forstwirtschaft. **[The cableway in the service of forestry.]** *Schweiz. Z. Forstw.* 100 (2), 1949 (105–14). [G.f.]

Describes in detail a simple form of cableway used in the Ticino, chiefly for the transport of firewood down steep slopes. The cable is fixed to a tree or rock at the upper level, and at the lower end is wound several times round a wooden cylinder placed behind strong stakes. This tension device is protected by a barrier formed of stakes, branches and earth with an old motor tyre hung in front of it as a shock absorber. The charge is suspended from the cable by wooden hooks (made from crotches in the forest, and expendable) and hemp rope or old cables, so that it can easily be untied. A normal charge weighs 80–90 kg. For distances of 500–1,500 m., 12-mm. cable is necessary; for shorter distances and lighter loads, 6- to 8-mm. suffices.

32.96. Loading and Unloading

See also *For. Abstr.* 11 (Nos. 1942–3).

1951. BALDWIN, H. L. **Log handling equipment.** *U.S. Patent* No. 2,467,354, April 12, 1949. *Abstr.* in *Paper Tr. J.* 129 (14), 1949 (42). P.R.

Equipment for handling logs, including: separate elements movable with respect to one another and each provided with a pair of chain conveyors, which are movable in aligned paths when the 2 elements are brought in registration; means for bringing all 4 chains in synchronization; an upright stake having a horizontally elongated foot, shaped to fit the chains and adapted to pass from one to the other; means of preventing movement of the foot lengthwise with respect to the chains.

1952. TUOVINEN, A. Niputusmenetelmät kehittyvät. **[Methods of bundling [of logs etc.] are improving.]** *Metsät. Aikak.* 1948 (7/8), (215–9). [Fi.]

A disadvantage in taking wood assortments by lorry to the floatway has been that they are not bundled directly, at the time of unloading. A method devised to remedy this, tried with 2-m. pulpwood, loads the lorry with two stacks of 6 cu.m. each (standard capacity) or a multiple, separated by stakes socketed in the middle of each of two planks nailed lengthwise along the chassis platform and 1 m. apart. Each stack is bound by a hoisting wire at the loading point and so lifted off the lorry by crane at the floatway. Drawbacks are (1) the use of cranes, whether fixed or mobile (the latter, on lorries, of 6,000 kg. hoisting capacity) is costly, as is also the construction of lorry landings; (2) larger timber assortments than pulpwood are difficult to handle; (3) unloading takes longer; (4) the hauling needs to be well timed or trucks may have to wait for unloading; (5) only large and sustained movements of wood can justify the outlay.

A new method of bundling on a pontoon is also described and illustrated. The bundling mechanism, which is simple and cheap, consists of a chain crib fed from a tipping truck. It cannot, however, take long pulpwood.

The writer envisages an increasing use, in Finland, of the 'Reki-Sorsa' (Sorsa sleigh) for bundling on frozen lakes, and of the practice of making big bundles on the ice.

1953. WALTERS, C. S., and KENT, B. F. **Packaged end-loading of log trucks in Illinois.** *For. Note Ill. agric. Exp. Sta.* No. 3, 1949. pp. 2.

Describes a method of loading an entire load of bundled logs over the end of a truck bed with a power winch.

1954. HEISKANEN, V. Pinotavaran kuormaus autoihin. **[Loading of stacked wood**

into lorries.] *Metsät. Aikak.* 1948 (7/8), (213–4). [Fi.]

The writer states that, until recently, Finland has not had in use any successful loading contrivances for stacked wood. Last spring, such a contrivance, designed by M. Terho of the Auto-Department, VAPO (Government Fuel Board), Kokkola, was under trial and the results so far are encouraging.

The ideal in lorry transport would be the non-stop running of lorries, without halts at loading and unloading points. By using interchangeable loading frames one approaches this ideal, as can be seen from the following comparative data:—

	Length of haul	*Loading*	*Hauling*	*Unloading*
	km.	%	%	%
Lorry with interchangeable frames	20	5·4	87·8	5·8
Ordinary lorry	20	29·3	56·8	13·9

The lorry has two detachable wooden frames, of somewhat stouter construction than the average frame for piled wood. When one of them is on the lorry the other is left in the depot for loading up. To the chassis of the lorry are attached two pairs of pulley wheels, one at the back and the other at the front. The lorry is brought close to the ready-made load and its empty frame man-handled off. From a winch in the forepart of the lorry, cables are taken through the pulley and fastened to hooks on the bottom of the loaded frame. Then the winch is set in motion (powered from the lorry engine) and as the front end of the loaded frame rises, the lorry is backed under it. When the frame has been brought sufficiently far forward, it is locked by a simple device, and the lorry is ready to drive away.

The lorry stops at the loading site for an average of only 7·2 min., when taking a load of 15 cu.m. (stacked); of this, 2·3 and 1·3 min. respectively are taken by removing the empty frame and loading the full one.

The unloading is done by tipping the frame off the back and letting the logs roll down, the whole unloading taking on an average 6·5 min. By comparison, unloading by man-power (two men) takes approximately 15 min.

1955. FOBES, E. W. **Improved harvesting methods. Equipment survey notes. Half-track log loader.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–34, 1949. pp. 2. P.R.

An efficient log loader is made from a standard war-surplus, half-track vehicle with an A-frame boom made from 20-ft. timbers mounted on the projecting chassis frame. The front-mounted winch, standard on this vehicle, is used to handle and power the loading line passing through a block at the top of the boom. This equipment gives the operator an unobstructed view and good control of operations. The description is illustrated by photographs.

1956. LOCKARD, C. R. **Improved harvesting methods. Equipment survey notes. Railroad-car log loader.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1637–36, 1949. pp. 2. P.R.

The loader is mounted on I-beam skids which are constructed to fit over the sides of an open railway truck, and can be slid from one truck to the next. The lower end of an A-frame boom is hinged to one end of the skids and the top is guyed to the other end. A wooden platform, built over the skids and metal framework, supports the operating machinery, consisting of a power unit and double drum hoist or yarding winch. The loading line is spooled on the large drum and the straw line on the smaller drum; this latter line is attached to the truck behind and is used to slide the loader back after the forward truck has been loaded. A crew of 3 can load a truck in 15–20 minutes. When loading is finished at one siding, the truck with the loader is moved to another, the boom being lowered during the move. It is seldom necessary to remove the loader from the trucks, but with a long lull in loading operations the loader can be slid on to a siding ramp.

1957. COLLIER, R. D. **Loading pulpwood out of water with crane and basket.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 69 (B–10), 1949. pp. 2.

33. CONVERSION AND PRESERVATION OF WOOD

1958. JAYME, G. **Survey of scientific and practical questions related to wood utilization and pulp and paper production**

in Australia. Abridged report. [*Report,*] *Technical Service to Industry, Division of Industrial Development, Melbourne,* No.E.3157, 1948. pp. 34. [Institute of Cellulose Chemistry, Technical University of Darmstadt.] P.R.

Describes visits to mills and forests and to scientific research institutes and makes comments and suggestions based on European research and experience.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

See also *For. Abstr.* 11 (No. 1910).

1959. **New woodworking machinery featured at Building Exhibition.** *Woodwkg. Ind.* 6 (11), 1949 (669–71, 673, 675, 677, 679, 681, 683, 685, 687, 689). P.R.

Describes briefly some of the machinery, tools and apparatus for woodworking, the manufacture of plywood and building boards, wood preservation and painting exhibited by 46 firms at the Building Exhibition held at Olympia, Nov. 17, Dec. 1, 1949.

Use of Wastes

See also *For. Abstr.* 11 (Nos. 2038–9, 2067, 2129).

1960. SIIMES, F. E. **Waste wood problem in the mechanical wood-converting industry of Finland.** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (31–3).

Losses in sawmilling amount to 42·3%, to which must be added 3·1% for shrinkage, making a total loss of 45·4% of logs. Waste in the plywood industry is relatively greater, because the Birch logs are comparatively crooked and oval in section and the core is not used. In 1939 (since when, improvements have been made) losses were 71% and finished plywood represented only 29% of the log. In the manufacture of furniture as much as 75%, and in bobbin manufacture 90%, of the original Birch may be lost in different phases of the work. The figures for sawmilling and plywood manufacture are broken down into their component parts.

1961. MCELHANNEY, T. A. **Waste wood in the forest and industry.** *Proc. World For. Congr.* No. 1, 1949 (177–88). [E.f.]

A general review of kinds of waste and the utilization of waste wood.

1962. GUERNSEY, F. W. **Utilization of sawmill waste in the southern coast region of British Columbia.** For. Prod. Lab., Can. (Vancouver). 1949. pp. 34 + 11 tbls. P.R.

Covers the present utilization of waste in the district, and forms of utilization in other regions.

1963. BOISCHOT, P., and BARBIER, G. **Wood sawdust as a source of humus.** *Transl. For. Prod. Aust.* 1949. pp. 3. Transl. by W. G. Kauman from *Rev. int. Bois* 16 (139), 1949 (13) [*For. Abstr.* 10 (No. 2689).] P.R.

1964. VOLPI, B. **Insecticides, fungicides, anticryptogams, antiparasites and related preparations on a cellulose carrier.** *Ital. Patent* No. 424,854, Sept. 3, 1947. *Chem. Abstr.* 43 (14), 1949 (5529–30). P.R.

Wood meal 90 parts is ground with paraformaldehyde 10, or wood pulp 20 with boric acid 20, or wood meal 96 with DDT 4 parts, etc. Finely ground cellulose powder has a high absorbing power, and is non-reactive and inoffensive.

33.12. Joinery, Turnery, Furniture and Cabinet-making

See also *For. Abstr.* 11 (No. 2076).

1965. HAYCOCK, A. H. **Principles of machine woodworking: The four-cutter. Four-cutter design.** *Wood* 14 (10; 11), 1949 (319–22; 353–6).

1966. **Hydraulically operated wood bender.** *Woodwkg. Industr.* 6 (7), 1949 (421). P.R.

The machine, which is manufactured by Rye Machinery Sales (High Wycombe) Ltd., 78 Desborough Road, High Wycombe, Bucks, will bend hardwoods in sections up to 8 in. wide × 2½ in. thick × 6 ft. 6 in. long. The shape of the bend is obtained by fitting a wooden former to the pin of the machine. The timber, which has been steamed, is placed in a metal tray, laid on the beams and clamped endways. The beams are set in motion by a control valve and the timber is wrapped round the former by hydraulic pressure. After a clip bar has been fixed, the tray can be removed and placed in the drying room. The time taken for bending

sections up to 2½ in. thick is 75 seconds. The drying time will vary with the size of the section but stable bends can be obtained in a time cycle of 24 hrs. in a drying-room temperature of 140° F.

1967. **Barrel finishing of woodware.** *Woodwkg. Industr.* 6 (7), 1949 (413–5, 427). P.R.

The different rumblers in common use are the round, the hexagonal and the square. White spar may be used in the rumbler to reduce swarf, saw marks and aris. The hexagonal barrel is used for small hardwood parts, and the rumbling process alone will remove rough edges, swarfs and splinters; if more delicate work is required, hardwood sawdust (with or without the addition of talc) will preserve turnings and sharp edges and give a better finish, but it will slow down the operation slightly. Hard wax is used in the rumbler for wax finishing. The square rumbler is less abrasive in action and stock can be left in for long periods without damage. The round rumbler is used for short softwood stock such as plant labels. In German and Japanese practice, small hardwood cubes or balls are used in the rumbler for burnishing large or medium-sized hardwood pieces, such as Indian clubs or shoe heels.

1968. WATERER, R. R. **Ploughwood, cartwood and trough making.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (10).

In Cyprus a number of farm implements are normally made from wood naturally shaped to the purpose. Wooden ploughs, cartwheels, handles etc. are fashioned from suitably shaped stems of *Quercus alnifolia*. Chairs are generally made from *Arbutus andrachne*. The material is selected from coppice fellings, and in 1947, 11,462 cu. ft. of timber was used for the purpose. Wooden troughs, fashioned on the dug-out principle in a single piece from Pine logs, are in great demand for household purposes. Trees that are unsound from heart rot fetch good prices for this purpose.

33.13. Cooperage. Shingles

1969. **Liquid manure tanks of Douglas Fir.** West Coast Lumbermen's Association, Portland, Oregon. 1944. pp. 2. P.R.

Gives material requirements and details of construction.

33.15. Manufacture and Use of Veneers and Laminated Woods. Improved Woods. Laminated Materials other than Wood. Glues and Gluing

1970. LESCHNER, F. Sperrholzimport und Sperrholzerzeugung in Argentinien. **[Imports and manufacture of plywood in Argentina.]** *Weltholzw.* 1 (4), 1949 (60–5). [G.] P.R.

Gives figures showing Argentina's imports, manufacture and exports of plywood and a list of Argentinian timbers used in plywood manufacture.

33.15.1. *Manufacture of Veneers and Laminated Wood*

See also *For. Abstr.* 11 (Nos. 1928, 1989–2001, 2090).

1971. **Selection of material for laminating.** *Timb. & Plyw.* 97 (2515), 1949 (479–80). P.R.

1972. **Plywood timbers.** *Rep. For. Dep. Uganda 1948*, 1949 (21–2).

Tests were made of several Uganda timbers for their suitability as veneer logs. *Celtis soyauxii* proved cross-grained and impossible to peel. *Holoptelea grandis* produced a very sickly-coloured veneer, unsuitable for facing. *Antiaris toxicaria*, which needs to be boiled for considerably longer than usual before peeling, was given a very good report. *Alstonia congensis* cut smoothly and cleanly, and yielded an excellent veneer. Although latex-duct perforations condemn this species for high-quality facing, these defects are not very prominent after manufacture into plywood, and in many sheets are barely noticeable. A second consignment of *Maesopsis eminii*, previously reported suitable for standard plywood, split badly after peeling. The logs may have dried too much in the time which elapsed between felling and receipt at the factory.

1973. CASE, G. O. **Report on possibilities of manufacturing veneers and plywood in British Guiana.** [Secondary and Minor Industries Board.] Georgetown, British Guiana. 1947. pp. 9 + vi.

Practical tests indicate that veneers and plywood of good quality can be manufactured

from a large number of British Guiana timbers. The establishment of a factory at an estimated cost of $1,630,000 for the manufacture of veneer and plywood in the colony is recommended. Lists appended show the species used with the quality classification of the veneers produced. The results of strength tests show that Greenheart (*Ocotea rodiaei*) compares favourably with Birch.

1974. **Veneer cutting and drying.** *Rep. For. Prod. Aust. 1948–9*, 1949 (38–9).

Veneers over a range of thicknesses from 0·0075 to 0·5 in. were cut from logs of *Pinus radiata*. No difficulties arose in cutting and drying veneers within this range and good supplies should be available if plantations are managed for the production of logs of suitable quality and size. Uses of veneers of various thicknesses are under investigation. Studies on the Ash Eucalypts as veneer and plywood species have continued. Data are being collected on schedules for heating veneer blocks in water to give best results for cutting and drying. [Cf. *For. Abstr.* 10 (No. 1992); 11 (No. 2114).]

1975. **Veneer-cutting tests to determine optimum temperature for the manufacture of Western Larch [*Larix occidentalis*] veneer.** *Rep. Nth. Rocky Mt. For. Range Exp. Sta. 1948*, 1949 (18).

Optimum temperature was found to be *ca.* 150° F.

1976. Byers, R. J., and Christian, M. B. (to Chicago Mill and Lumber Co.). **Veneer.** *Canad. Patent* No. 453,468, Dec. 21, 1948. *Chem. Abstr.* 43 (14), 1949 (5569–70). P.R.

For forming a composite board without substantial shrinkage loss from the expanded green-wood condition of the wood veneer, a sheet of the veneer, containing above 30% moisture, has its faces coated with a slow-setting, water-resistant glue. The coated faces are covered with tough, flexible, absorbent paper, advanced between rollers for cold-pressure treatment, including pressing of moisture from the wood into the paper, and pressing the adhesive into both the wood and the paper to form a bond, and finally hot-pressed to dry the wood and set the adhesive, and so to hold the wood in an expanded green-wood condition.

1977. Lacey, P. M. C., and Howe, H. A. **Electrically-heated cauls for veneering.** *Wood* 14 (9), 1949 (269–74).

Describes a method evolved at Princes Risborough, for making and using wire-wound electrically heated elements in the form of thin sheets, which may be used as cauls between the veneered assemblies stacked in a cold press to accelerate the hardening of cold-setting resin glues. The cauls, operating at mains voltage, raise temperatures near the glue-line to a point at which the glues set rapidly. No thermostats can be fitted, so an exact time cycle must be followed. The results of investigations into heating rates, pressing times, edge-cooling effects and power requirements are given, with details of design and manufacture of the cauls.

1978. **Gluing problems: visible defects and miscellaneous problems [in veneer gluing].** *Cabinet Mkr.* No. 2607, 1949 (131–3). *Repr.* from *Aero Research Technical Notes, Duxford.* P.R.

1979. Selbo, M. L. **Effect of width and thickness of laminations in laminated White Oak beams upon the strength and durability of the glue bond.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1713, 1948. pp. 6 + 13 photos, 4 tbls. P.R.

Tests were carried out on laminated beams 45 in. long and with the following cross-sectional diameters: $4 \times 4\frac{1}{2}$; $8 \times 10\frac{1}{2}$; $14 \times 4\frac{1}{2}$; and $24 \times 4\frac{1}{2}$ in. Individual laminations varied from $\frac{1}{8}$ to $1\frac{5}{8}$ in. in thickness and from 4 to 24 in. in width. The thickness and width of the laminations within these limits apparently had no significant effect on the strength and durability of the glue bonds. Where beams contained laminations differing appreciably in density, there was less deformation along the sides after exposure to wide variations in moisture content in beams made with thin rather than thick laminations. *From author's summary.*

1980. Selbo, M. L. **Effect of mixing flat and vertical grain in laminated wood beams.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1718, 1948. pp. 4 + 3 photos, 2 tbls. P.R.

Laminated White Oak beams were made with all vertical-grained laminations or with alternate vertical and flat-grained boards, and were subjected to long-term soaking and

weathering. The results indicated that adequate and durable glue bonds can be obtained in both types of construction, but that vertical-grained Oak laminations have a tendency to develop cleavage parallel to the glue lines when subjected to severe exposures and therefore may be less desirable than flat-sawn Oak material for use in members intended for exterior service. *From author's summary.*

33.15.2. *Use and Properties of Plywood and other Laminated Wood*

See also *For. Abstr.* 11 (Nos. 1854–5, 1979–80, 2141–3, 2212–7, 2223).

1981. THIELEMANN, W. **Contribution to the problem of the bulging of orthotropic plates with special reference to plywood panels.** *Transl. Minist. Supply* No. GDC 10/3126 T. [*n.d.*] pp. 72 + 41 dgms., gphs., 3 tbls. 8 refs. Transl. from *F.G.H. Report* No. 150/19, 1945. P.R.

1982. ISENSEE and KESSELKAUL. **The mechanical strength of T.V.Bu 20 laminated wood and T.V.Bu 20/2 multi-ply wood.** *Transl. Minist. Supply* No. GDC 10/1126T [*n.d.*] pp. 22 + 54 dgms., gphs., 35 tbls. 14 refs. Transl. by J. M. Clunan from *ZWB Report F.B.* No. 1223, 1940. P.R.

1983. NORRIS, C. B., WERREN, F., and MCKINNON, P. F. **The effect of veneer thickness and grain direction on the shear strength of plywood.** *Rep. U.S. For. Prod. Lab., Madison* No. 1801, 1948. pp. 28 + 7 photos, 2 dgms., 20 gphs. 8 refs. P.R.

From test results given in graphs and tables, the following conclusions can be drawn:—(1) The shear strength of a plywood panel is greatly influenced by the thickness of the veneers. A formula for the shear strength in relation to number of plies, thickness, and shear strength of the solid wood, is given. (2) Plywood panels of different construction but with the same number, thickness, and species of veneers, will have similar shear properties. (3) The method for testing shear strength may greatly affect the results obtained. (4) Checks made in cutting the veneer vary with species and veneer thickness; the depth of the check increases with veneer thickness, but the number of checks is apparently not affected. *From authors' summary.*

1984. RINGELSTETTER, L. A., and NORRIS, C. B. **The effect of a stiffener on the maximum load of flat plywood plates in edgewise compression, with the face grain at 0° and 90° to the load: a single stiffener parallel to the direction of loading, load edges simply clamped, others simply supported.** *Rep. U.S. For. Prod. Lab., Madison* No. 1553–D, 1949. pp. 7 + 2 photos, 2 gphs., 2 tbls. P.R.

When flat plywood plates subjected to edgewise compression are stiffened by a centrally located stiffener parallel to the load, the increase in the ultimate load of the plate is related to the size of the stiffener. The analysis of the results of tests on 45 specimens yields an empirical family of curves from which the ultimate loads can be estimated.

33.15.3. *Improved Woods*

1985. FALINSKI, M. Imprégnation des bois par les résines synthétiques. **[Impregnation of wood with synthetic resins.]** *Recherche Aéronautique, Paris* 1949 (8), (19–28). 12 refs. [F.f.] [Office National d'Études et de Recherches Aéronautiques, Paris.] L.S.

The theories of penetration and permeability are discussed and some figures given for the permeability to water of Beech, Poplar and Spruce for different fibre directions. Impregnation of the 3 species with a melamine resin by capillary diffusion was unsuccessful; in the presence of wetting agents, good penetration into Beech was obtained, but results for Spruce and Poplar remained unsatisfactory. A method based on osmotic diffusion was tested on Spruce, Fir, Beech and Poplar; the plies were first swollen by soaking in various liquids and the resin was then applied dry. A microscopic comparison of plies treated by this method and the usual vacuum-pressure method showed that the former gives a more uniform penetration of the wood. It is also more economical.

1986. GENEL', S. V. **Reduction of hygroscopicity of wood by treatment with molten aromatic amines.** *Transl. For. Prod. Aust.* 1949. pp. 16 + 11 gphs., 7 tbls. Transl. by M. Slade from *Lesnaya Prom.* 1948 (1), (18–23). [*For. Abstr.* 10 (No. 386).] P.R.

1987. MATHIEU, H. Les bois valorisés (Procédé de M. J. Grisard). **[Improved**

woods (The M. J. Grisard process).] *Rev. Bois Appl.* 4 (11), 1949 (36). [F.]

The sawtimber is placed in an autoclave and subjected to treatment with saturated steam at a high temperature and a pressure dependent on the species, the thickness of the stock, and the colour required. The steam is introduced gradually so that maximum pressure is reached in 2 hr., and then decreased gradually. The hot, moist wood is then withdrawn from the autoclave and transferred to a kiln where it is dried rapidly. The entire treatment takes 6 hr., and the costs range from 3,500 to 7,000 fr./cu.m. for deciduous, and from 2,000 to 3,500 fr. for coniferous woods. The treated timber has good working qualities, a darker colour and finer appearance, higher resistance to fungus and insect attack and reduction in shrinkage and swelling. Tests at the Institut National du Bois on treated Poplar showed compressive strength of 530 kg./sq. cm. (untreated control 400 kg.) and an increase of moisture content after 12 days at 40° C. of 6·3% (control 10·7%). The process is soon to be exploited commercially in France.

33.15.4. *Laminated Materials other than Wood*

See also *For. Abstr.* 11 (No. 1989).

1988. BÜRNHEIM. **The fatigue endurance of steel/plywood bondings.** *Transl. Minist. Supply* No. G.D.C. No. 16/428T [*n.d.*]. pp. 1 + 2 gphs. Transl. from *F[ocke-]W[ulf] Experimental Report* 23.11.44. P.R.

33.15.5. *Glues and Gluing*

See also *For. Abstr.* 11 (Nos. 1976–80, 1988).

1989. **Adhesives for industry.** Aero Research Limited, Duxford. [1949?] pp. 59. P.R.

Contains sections on: introduction to modern synthetic resin glues; assembly glues (wood to wood, wood to plastic, wood to rubber); glues for plywood manufacture and veneering; glues for edge-to-edge joining; specification requirements (British Standards); metal bonding (including metal to wood); and definitions.

1990. KUHN, J. Mowicoll H: Eigenschaften und Anwendung. **[Mowicoll H [a new glue]: its properties and use.]** *Holztechnik* 29 (8), 1949 (158–60). [G.] P.R.

1991. **New urea glue.** *Sth. Lumberm.* 179 (2244), 1949 (59).

A new type of urea-resin glue, 'Casco Resin 155' has been introduced by the Borden Co.'s Chemical Division. It can be used with either of 2 catalysts, 'FM–140' for cold-press and 'H–55F' for hot-press operations. This glue is more durable than the standard type, since it will endure boiling, high temperatures and humidity.

1992. COLLINSON, H. A. **Phenol resins for plywood manufacture.** *Timb. & Plyw.* 97 (2519), 1949 (650). P.R.

1993. WILLIAMSON, R. V., and LATHROP, E. C. **Agricultural residue flours as extenders in phenolic resin glues for plywood.** *Mod. Plastics* 27 (2), 1949 (111–2, 169–70, 172, 174). P.R.

Evidence obtained from experiments on glues extended with agricultural residues indicated that the % of wood failure furnishes no information on the properties of a glue, other than the relative strengths of glue and wood.

1994. Charges organiques dans l'utilisation de la colle caurite. **[Organic fillers in the use of Kaurit glue.]** *Rev. Bois Appl.* 4 (6), 1949 (37–8). [F.]

1995. BRANDTS, T. G., and GRIFFIOEN, K. Beproeving van de Ciba kunstharslijmen Melocol H en M met het hardingsmiddel 205 in combinatie met katjang idjo-meel. **[Testing of the Ciba synthetic resin glues Melocol H and M with hardener 205 in combination with flour of Katjang Idjo [*Phaseolus radiatus*].]** *Rapp. Bosbouwproefsta., Buitenzorg* No. 18, 1949. pp. 13. [Du.du.e.] [Serie Houtlijming No. 1.]

1996. **Mechanism of setting of glues and the nature of their adhesion to wood.** *Rep. For. Prod. Aust. 1948–9*, 1949 (40–2).

1997. NARAYANAMURTI, D., and DAS, N. R. **Composite wood and wood preservation: The influence of psychrometric conditions on the setting time of adhesives.** *Indian For. Leafl.* No. 114, 1949. pp. 4 + 1 dgm., 4 gphs.

The results of studies on the influence of psychrometric conditions on the setting time of a urea-formaldehyde (Aerolite) resin adhesive, casein glue, and animal glue respectively, are described. Humidity was found to influence Aerolite differently from the other glues. While, for the casein and animal glues, the shape of the curve is similar to that of the equilibrium-moisture-content curve, for Aerolite it is S-shaped. The denser the timber, the greater, normally, is the time taken for setting. *From authors' summary.*

1998. SELBO, M. L. **Durability of resorcinol glue bonds in gusset-type assembly joints similar to those used in wood boats.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1714, 1948. pp. 11 + 10 photos, 2 dgms., 3 gphs., 3 tbls. P.R.

Results of tests indicated that the durability of resorcinol glues was superior to that of casein and urea-resin glues. With resorcinol glues, durable bonds were obtained at curing temperatures as low as 40° F. in assembly joints involving solid Mahogany or Spruce and Douglas Fir plywood, and at 70° when solid White Oak and Douglas Fir plywood were used. *From author's summary.*

1999. CZERWINSKI, W. **Assembly gluing for small workshops—with particular reference to synthetic resin adhesives.** *Wood* 14 (11), 1949 (340–2).

Practical pointers for the use of a urea-formaldehyde cold-setting glue in small workshops.

2000. PERRY, T. D. **Types of pressure applications for gluing.** *Wood Prod.* 54 (10), 1949 (35–40).

Reviews methods of applying pressure in gluing by:—(1) gravity, (2) screws, (3) springs, (4) pistons, (5) wedges or cams, (6) inflated tubes, and (7) fluid pressure (bag moulding).

2001. LACEY, P. M. C., and HOWE, H. A. **Radio frequency and other special heating processes. Progress report 4. Measurement of radio frequency power in glue-line heating.** For. Prod. Res. Lab., Lond. 1949. pp. 21 + 18 dgms., 5 gphs. P.R.

33.17. Sawmilling

2002. LATHAM, B. **The development of sawmilling.** *Wood* 14 (10), 1949 (316–8).

A brief history of the development of the industry in Great Britain.

2003. [GREENSTEIN, A. W.] **Instrumentation in the sawmilling industry.** *Aust. Timb. J.* 15 (5), 1949 (322, 324, 368).

Part of an address delivered to the Annual General Meeting of the South African Lumber Millers' and Shook Manufacturers' Association. It comprises short descriptions of various kinds of instrument used in sawmilling and kiln-drying operations.

2004. [HARRIS, P.] **Sawmilling research.** *Timb. & Plyw.* 97 (2514), 1949 (446, 448). [Extracts from a paper read at the 1949 meeting of the British Association.] P.R.

The relative popularity of different types of saws and sawbenches in different countries is discussed. Improvements in output of tropical hardwoods may be achieved (1) by ensuring that teeth cut effectively by adjusting the pitch, height or shape of the teeth; and (2) by hard-tipping the teeth of the saws with high-speed steel, special steel alloys, cobalt-chromium-tungsten alloys (Stellite) or tungsten-carbide. Hard-tipping has been successfully used on small circular saws, but has not yet been applied to wide band saws or large circular saws. Both Stellite and tungsten-carbide are hard but brittle.

2005. ACKERMAN, D. P. **The choice of sawmill equipment in South Africa.** *J. S. Afr. For. Ass.* No. 18, 1949 (6–19 + 6 photos). [E.]

Discusses various types of sawmilling machinery and the factors determining which types should be used, such as the range of log diameters, the value of the logs, and the volume of timber handled. Recommendations are made with special reference to South African conditions. *Author's summary.*

2006. **A new machine. Features of the Nordberg-Buday saw bench.** *Timb. Tr. J.* 190 (3811), 1949 (1871).

The Nordberg-Buday portable power saw, with its unique rotating table top, saves laborious handling and turning of long timber. Table, saw spindle, and power drive are combined in a single unit which revolves quickly and smoothly to the desired angle for any cut. In cross-cutting, the saw blade, which is pivoted together with the drive assembly, is swung by

hand and foot pressure. Only in ripping does the timber have to be fed to the saw. The unit is powered by petrol engine or electric motor. It will cross-cut up to 12 × 3 in. or 4 × 4 in. with a 12-in. blade and will rip up to 4 in. deep.

2007. LAPIN, P. I. **Planing saws.** *Transl. For. Prod. Aust.* 1949. pp. 10. Transl. by P. A. Gibson from *Lesnaya Prom.* 1948 (6), (15–8). [*For. Abstr.* 10 (No. 2027).] P.R.

2008. CREASEY, A. E. **Feeding of wood to a sawing machine.** *Brit. Patent* No. 624,950, June 20, 1949. Price 2*s*. *Abstr.* in *Timber News* 57 (2124), 1949 (417).

2009. **Saw guard of plexiglass gives complete visibility.** *Wood Prod.* 54 (9), 1949 (45).

Describes a transparent guard for circular saws of 8–20 in. diameter, which keeps the blade covered, yet allows an unimpeded view of the saw and work. The guard is manufactured by the Laminated Sheet Products Corp., 259, A Street, Boston 10, Mass.

2010. MINOT, G. La précision dans le sciage. [**Precision in sawing.**] *Rev. Bois Appl.* 4 (6), 1949 (20–2). [F.]

Describes different types of saw and methods of getting the best output from them.

2011. TOWERS, W. K. **Increasing band saw production.** *Wood-worker, Indianap.* 68 (7), 1949 (36, 38). P.R.

Notes on machine adjustment needed to increase output.

2012. WORTHINGTON, N. P. **Lumber grade recovery and milling costs from second growth Douglas Fir of central western Washington.** *Timberman* 50 (11), 1949 (58, 60, 62, 64, 66). [Pacific Northwest Forest and Range Experiment Station, Portland, Ore.]

Presents the results of a study of lumber grade recovery and sawmilling costs in 4 small mills in south central Washington, which were manufacturing small second-growth Douglas Fir logs into rough green lumber. The mills had a daily capacity of approximately 15,000 bd. ft. and the logs had a diameter range of 6–28 in. and averaged 14 ft. in length. Differences in lumber grade recovery between log grades was very small, with log sizes having but little effect on lumber grade. Sawing-time curves were plotted and used as a basis for allocating milling costs, which averaged $15.43 per 1,000 bd. ft. *From author's summary.*

2013. QUIGLEY, K. L. **Lumber production rate from various-sized logs at Missouri Ozark sawmills.** *Sta. Notes Cent. St. For. Exp. Sta.* No. 55, 1949. pp. 2.

Table shows lumber production per hour and sawing time per 1,000 bd. ft. for logs of different diameters.

2014. THOMSON, C. C. **Small logs in the sawmills of Eastern Canada.** *For. Chron.* 25 (3), 1949 (187–90).

Studies carried out at the Forest Products Laboratory, Ottawa, indicate that small logs are being much used for the manufacture of lumber in Eastern Canada. The % of log volume converted into lumber increases with log diameter. The number of man-hours required to saw 1,000 bd. ft. of lumber decreases as log diameter increases, up to a point past which it may increase again, especially in mills not designed to handle large logs. Sawmilling costs vary with diameter of logs in much the same fashion as man-hours, but under some conditions cost figures may vary considerably according to the log scale used.

33.3. *Chemical Treatment*

2015. HÄGGLUND, E. **Developments in the field of chemical wood utilization.** *Proc. World For. Congr.* No. 1, 1949 (189–96). [E.f.]

2016. NYBERGH, B. **Development of chemical forest products industries [in Finland].** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (34–5).

Use of Wastes

See also *For. Abstr.* 11 (Nos. 1875–84, 2122, 2127–8).

2017. JAYME, G. Hemicellulosen und ihre Verwertung. [**Hemicelluloses and their utilization.**] *Papier-Fabrikant, Berlin* 1944 (9), (295–304). 69 refs. [G.] L.S.

An extensive survey of methods of extracting and recovering hemicelluloses from wood, of the influence of hemicelluloses on pulp, and of their chemical utilization.

2018. DAWSON, T. R. **Lignin.** *Transactions, Institution of the Rubber Industry, London* 24 (5), 1949 (227–40). 20 refs. L.S.

Figures are given of the amount of lignin at present available annually in the U.S.A. Suggested formulae for lignin, and its chemical and physical properties, are discussed. The main uses, and other possible uses for lignin, as fertilizer, fuel in the pulp industry, in adhesives and plastics, and as a source of vanillin, are briefly discussed. Tables are given showing the results of research in U.S.A. and Canada on the use of Aspen and coniferous lignins for reinforcing rubber; results suggest that lignin is surpassed only by the best carbon black, and that the properties of rubber reinforced by lignin are good.

2019. **Lignin as plastics raw material. [A review of Italian research.]** *Chem. Age, Lond.* 60 (1561), 1949 (858–9). 11 refs. D.S.I.R.

2020. KIPPHAN, K. Lignin aus der Holzverzuckerung als Rohstoff für Kunstharze. **[Lignin from wood saccharification as raw material for synthetic resins.]** *Kunststoffe, München* 39 (3), 1949 (71–2). 5 refs. [G.g.] D.S.I.R.

Lignin from wood saccharification can be made more plastic and soluble by solution in alkali under pressure and reprecipitation, or by chlorination. Products with the physical properties of synthetic resins can be obtained by the reaction of lignin with phenols, aromatic amines, and aliphatic compounds with hydroxyl or amine groups. Lignin-phenol resins have very similar properties to those of phenol-formaldehyde resins. Methods and proportions for preparing lignin-phenol resins, with figures for their mechanical properties are given.

2021. HARRIS, E. E., SAEMAN, J. F., and BERGSTROM, C. B. **Lignin hydrogenation products.** *Industr. Engng. Chem.* 41 (9), 1949 (2063–6). 16 refs. P.R.

Two samples of lignin from soda-process liquors were hydrogenated. In both cases about 70% of the lignin was converted into volatile products, including gas, water, hydrocarbons, methyl alcohol, ketones, cyclic alcohols and phenolic acid compounds. Hydrogenation at 325° C. produced 14% water, 8% methanol, 8% tar acids, 13·3% O compounds, 21·8% unsaturated and 2% saturated hydrocarbons, 4% gas and 28% heavy oil. Hydrogenation at 400° C. produced similar products in different amounts.

2022. SANDERMANN, W. Über die Umsetzung von Lignin und Holz mit Dicarbonsaüreanhydriden. **[On the decomposition of lignin and wood with dicarboxylic acid anhydrides.]** *Svensk PappTidn.* 52 (15), 1949 (365–70). 23 refs. [G.e.sw.] P.R.

2023. MEREWETHER, J. W. T. **Studies of the lignin of *Eucalyptus regnans*. III. The isolation of an alkali lignin from sulphate pulping.** *Aust. J. sci. Res.* 2*A* (1), 1949 (117–26). 9 refs. [Research Laboratories, Australian Paper Manufacturers Limited, Melbourne.] P.R.

An alkali lignin containing no sulphur has been obtained as a by-product from the sulphate pulping of *E. regnans*. Like other alkali lignins, it contains hydroxyl groups, both acidic and alcoholic, as well as methoxyl groups. An empirical formula consistent with experimental data is presented. [Cf. *For. Abstr.* 11 (No. 1880).] *From author's summary.*

2024. **Aldehydes from Eucalypt lignins.** *Rep. For. Prod. Aust. 1948–9*, 1949 (12).

Twelve species of Eucalypt wood have been subjected to nitrobenzene oxidation, and the resulting aldehydes examined. There is considerable variation in the ratio of syringaldehyde to vanillin, ranging from 1½ : 1 to 5 : 1. A third substance, as yet unidentified, in the aldehyde mixture appears to be an aldehyde present in only a small quantity. [Cf. *For. Abstr.* 10 (No. 1878).]

2025. ABRAHAMSON, B., LINDGREN, B. O., and HÄGGLUND, G. **On the sulphonation of Spruce lignin.** *Transl. For. Prod. Aust.* 1949. pp. 11. Transl. by M. Slade from *Svensk PappTidn.* 51 (20), 1948 (471–4). [*For. Abstr.* 10 (No. 1889).] P.R.

2026. **The utilization of waste sulphite liquor.** Forestry Committee, Research Council of Ontario, Toronto. 1949. pp. 21. P.R.

Comprises a series of papers prepared for the Forestry Committee on: the oxidation of waste sulphite liquor; liquid-liquid extraction of waste sulphite liquor; ion-exchanging of liquid resins, a survey of the utilization of waste

sulphite liquor as a tanning agent; industrial fermentations of waste sulphite liquor.

2027. SMITH, H. L. JR. **Thermal compression evaporation—its application to the concentration of waste sulphite liquor.** *Pulp Paper Mag. Can.* 50 (9), 1949 (84–6). 3 refs.

Presents calculations for the design of a commercial thermal-compression evaporating unit of sufficient capacity to concentrate a plant's entire output of 10% solid sulphite liquor.

2028. BUTLER, W. T. **Evaporation and burning of calcium base sulphite liquor.** *Pulp Paper Mag. Can.* 50 (11), 1949 (108–21). 52 refs.

A review of research on these problems, based on world literature, with a bibliography containing short abstracts.

2029. GARDNER, J. A. F. **The oxidation of waste sulphite liquor.** *Pulp Paper Mag. Can.* 50 (9), 1949 (102–4). 34 refs. [Forest Products Laboratory, Vancouver.]

A review of world literature on the subject.

2030. MÜLLER, O. A. **Tanning material from sulfite waste liquor.** *Swiss Patent* No. 248,213, Jan. 16, 1948. *Chem. Abstr.* 43 (15), 1949 (5982). P.R.

2031. JENSEN, W. **Chromatographic analysis of tall oil. II. Determination of fatty acids.** *Papp. Trävarutidskr. Finl.* 31 (16), 1949 (293–4). 3 refs. [E.] P.R.

Cf. *For. Abstr.* 11 (No. 1270).

33.32. Pulp and Paper Manufacture. Wallboards. Plastics

See also *For. Abstr.* 11
(Nos. 1572, 1809, 2017–30, 2203, 2391).

2032. **Report of the preparatory conference on world pulp problems, Montreal, Canada, 25 April—4 May 1949.** FAO, Washington. 1949. pp. 58.

Besides recommendations and conclusions, the report includes statements by participating countries and reports of committees on utilization of tropical woods, and on straw-pulp and strawboard.

2033. NYBERGH, B. **The activity of the Central Laboratory [Helsinki] during 1948.** *Papp. Trävarutidskr. Finl.* 31 (17), 1949 (305–7). [E.] P.R.

A brief account of research on different aspects of pulp and pulping.

2034. **Pulp and paper manufacture in the United States. Summary for 1948.** *Tappi, Easton, Pa.* 32 (5), 1949 (18*A*, 20*A*, 22*A*, 26*A*). L.S.

33.32.1. *Pulp Manufacture*

See also *For. Abstr.* 11
(No. 1847, 1875–86, 1926–30, 1933–5).

2035. IVARSSON, B. Praktisk handledning för fiberidentifiering. **[A practical guide to fibre identification.]** *Svensk PappTidn.* 52 (20), 1949 (493–504). 7 refs. [Sw.e.g.] P.R.

Data for the identification of fibres commonly used in Swedish paper manufacture are based on a critical study of the literature. The different methods of analysis—by colour reactions and by morphological study—have been checked, as well as their usefulness in practice. Special attention has been paid to the morphological analysis and a number of new microphotographs are presented to supplement those already available. *From author's summary.*

2036. MÜHLSTEPH, W. **Effect of the shape of the fibre on the properties of cellulose. 1. The absorption capacity of celluiose films for liquids.** *Transl. Inform. Serv. Coun. sci. industr. Res. Aust.* [1949?] pp. 11. Transl. by M. Slade from *Holz Roh- u. Werkstoff* 3 (2), 1940 (45–9). P.R.

The shape of the fibres of different wood pulps is shown to influence their compactness in the sheet, and the amount of water taken up by them. A special natural plasticity is shown to exist in conifer- and Aspen-pulp fibres; this and the fibre shape are chiefly responsible for the pre-eminence of conifer cellulose.

2037. BRYDE, Ø. **Nitration as a tool in the study of wood and wood pulping processes.** Papirindustriens Forskningsinstitutt, Skøyen, Norway. 1949. pp. 10 + 7 gphs. [E.f.] (A paper presented at the 4th meeting of the F.A.O. Committee on Wood Chemistry, August 1949, in Brussels.) P.R.

The process consists of: (1) the nitration of the sample, followed by washing with acetic acid and water; (2) the extraction of the crude nitrates with methanol, giving nitrates and the

methanol-soluble fraction, 'C' cellulose; (3) the treatment of the nitrates with acetone, giving acetone-soluble and insoluble fractions; (4) the addition of the acetone solution to a large excess of water, giving a precipitable and a non-precipitable fraction, 'A' and 'B' cellulose respectively. It is believed that the original molecular weights of the components and some of their other molecular properties are preserved during fractionation. Results showing the yields of the different fractions from different types of pulp are presented in graphs. Figures relating to the viscosity of the 'A' and 'B' celluloses, and the distribution of lignin, total carbohydrates and sugars in the different fractions are given. The experiments were made on *Picea abies* and will be continued on other northern woods, but it is considered that the method is applicable to the general study of wood samples and their pulping qualities and that it may be particularly useful in studying the pulping properties of species not yet used for pulp.

2038. BEECHER, H. W. **Burning of wood waste in the pulp and paper industry.** *Tappi, Easton, Pa.* 32 (3), 1949 (117–8). L.S.

Average prices of sawmill waste are given as from 50 c. to $1·75 per unit of 200 cu. ft. The fuel, if Fir, will have a moisture content of 47–52%, if Hemlock or Spruce, 55–63%, the moisture content varying with the season. For power-plant calculations the average B.Th.U. content is estimated at 8,900 B.Th.U./lb. coniferous fuel. A unit of average sawmill-waste fuel will produce a little more steam than 2 barrels of oil, and a little more than half as much as a ton of coal (12,500 B.Th.U./lb.). It is therefore considerably cheaper to burn waste wood, at reasonable transport costs, than oil or coal at present prices in the U.S.A. A graph is given showing the relationship between costs of Fir and Hemlock fuel, oil, and coal. Types of boiler and methods of operation are discussed.

2039. MCBRIDE, C. F., and RYMER, K. W. **Project V–7–3. Report on the utilization of sawmill waste for pulpwood.** *Mimeo For. Prod. Lab., Can.* No. V–1006, 1949. pp. 9 P.R.

Results of a study made to provide more detailed information on the volume of solid wood in a cord of sawmill waste, show that a considerable variation exists between hand- and machine-piled waste, and between these and a loose cord of stovewood-length waste. The results, given in tables and a graph, do, however, provide a basis for estimating what volume of chips can be expected from this waste when certain minimum specifications are observed.

2040. JONES, J. B. **Wood—its preparation and measurement.** *Tappi, Easton, Pa.* 32 (2), 1949 (58–62). [The Ontario Paper Co. Ltd., Thorold, Ont.] L.S.

[Cf. *For. Abstr.* 11 (Nos. 1926–31, 2056).] Barking drums, hydraulic and knife barkers, and the 'woodpecker' for gouging out knots, bark pockets and rotten wood are described. A diagram shows the arrangement of the wood room of the Ontario Paper Co., for handling both barked and unbarked wood. The volume of the wood is determined by lowering a cage containing the wood into a large tank of water and noting the difference in the water level. The Blake-Denison automatic log weigher is in use in several Canadian mills, weighing the wood as it comes in from the mill yard. A short section of the conveyor is suspended over a weighing system and as the material passes over it is weighed in sections of a predetermined length and the weight automatically recorded. The importance of knowing wood density in determining costs is emphasized.

2041. WURZ, O. Zellstoffe aus Schälspänen des Fichtenreppelholzes. **[Pulps from chips of Sprucewood obtained by knife barking.]** *Textil-Rundschau, St. Gallen* 1 (6), 1946 (174–8). [G.g.] B.C.I.R.A.

Dry shavings from the knife barker, consisting largely of sapwood with 15–18% bast and the cells of the cambial layer, were cooked by different methods. A sulphite cook gave pulp with breaking length of about 6,800 m. and a folding strength of about 250 double folds. The inner bark, cooked separately, gave a sheet with 5,200 m. breaking length and 0 folding strength; it contained a quantity of reducing substances. An alkaline cook gave pulp with breaking length 7,400 m., folding strength 520 from the shavings, and breaking length 8,000 m. folding strength 900 from the inner bark alone. Hot-water extraction of the inner bark gave 41% extractives.

2042. KIVIMAA, E., and MURTO, J. O. **Investigations on factors affecting chipping of pulpwood.** *Julkaisu, Valtion teknillinen Tutkimuslaitos, Helsinki* No. 9, 1949. pp. 25. 6 refs. [E.e.] *Transl.* of *Papp. Trävarutidskr. Finl.* 30 (21), 1948 (383–93). P.R. See *For. Abstr.* 11 (No. 461).

2043. GRIFFIOEN, K. Kort overzicht van de ontsluitings methoden van hout voor de celstofen papierfabricage. [**A short review of methods of pulping wood for the manufacture of cellulose and paper.**] *Tectona* 38 (5), 1948 (291–305). [Du.]

Reviews briefly the various methods of chemical and mechanical pulping, and then indicates those best adapted to Indonesian species—*Pinus merkusii, Agathis* spp., and several hardwoods (cellulose content in brackets), *Anthocephalus cadamba* (47·5%), *Shorea* spp. (49·5–52·5%), *Calophyllum* spp. (45–50%) and *Anisoptera marginata* (41%).

2044. ZAPPERT, K. O aproveitamento do Pinho do Paraná na fabricação de celulose e papel. [**The use of Paraná Pine in the manufacture of pulp and paper.**] *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (275–80). [Port.] P.R.

Three types of pulp are now being manufactured from Parana Pine [*Araucaria angustifolia*] at Monte Alegre, Tibagy:—(1) sulphite, (2) kraft, and (3) mechanical pulp. Mechanical pulp from Paraná Pine has longer fibres, and therefore better physical properties than imported mechanical pulp, but it is darker in colour. Hence a rigorous selection of suitable light-coloured wood has to be made. Selection is also necessary for sulphite pulp, but Paraná Pine has proved eminently suitable for kraft pulp, and the Monte Alegre product is considered superior to imported kraft pulp.

2045. JAYME, G., SCHENCK, U., and ROTHAMEL, L. Über gesetzmässige Änderungen der Eigenschaften innerhalb desselben Stammes von Pappelhölzern. [**On the regular changes of properties within the same stem of Poplar.**] *Papier, Darmstadt* 3 (1/2), 1949 (1–7). 7 refs. [G.g.] L.S.

An examination was made of stems of × *Populus serotina*, × *P. robusta* and *P. trichocarpa* to determine the variation of properties at points between butt and crown. The content of pentosan, ash, and cellulose and the yield of sulphate pulp decreased, and the yield of methanol-benzene extractives increased from butt to crown; the lignin content appeared to be highest at an intermediate point. The variation, with height, of the yield of sulphate pulp was 1·26 to 4·31%, the difference being greater where the total yield was low. No progressive alteration of specific gravity from butt to crown was apparent except for *P. trichocarpa*, in which the specific gravity of the sapwood decreased from butt to crown and that of the heartwood increased. The bark content was lower at an intermediate point than at butt or crown, and was somewhat higher for 10- than for 30-year old trees. × *P. robusta* had a higher cellulose content than × *P. serotina* of the same age and grown on the same site; in favourable conditions, however, the latter showed a very high cellulose content at 10 years. There is no danger of a reduction of the cellulose content as a result of close planting in trees of less than 10 years old, but unless thinning is carried out in 10-year-old stands suppression of some trees will reduce the cellulose content.

Sulphate-pulp yield of Beech from a modified kraft process was a little under 53% against 51–62% for Poplar. These conditions failed to delignify Spruce, which from a more drastic cook (3 hours at 170° C.) gave only 49·4%. The over-all yield of cellulose from these 3 species is satisfactory, in spite of the decrease in cellulose content from butt to crown, which is significant only in the case of poorly grown specimens.

2046. VENEMARK, E. **Green or dry, fresh or stored wood, for the manufacture of sulphate pulp.** *Transl. For. Prod. Aust.* 1949. pp. 15 + 2 dgms. Transl. by E. Selman-Towt from *Svensk Papp Tidn.* 51 (18), 1948 (418–24). [*For. Abstr.* 10 (No. 2051).] P.R.

2047. JAYME, G., and HARDERS-STEINHÄUSER, M. Der Besenginster—ein botanisch-anatomischer Bericht. [**Broom—a botanical and anatomical account.**] *Papier, Darmstadt* 2 (15/16), 1948 (276–87). 21 refs. [G.g.] L.S.

The distribution, botanical features, cultivation, and wood anatomy of Broom (*Cytisus scoparius*) are discussed and the fibre structure of the pulp, in comparison with those of Poplar and Spruce, is described and illustrated in photographs. The average length of the

pulp fibres, about 0·46 mm., is comparable to that of pulps from annuals. The strength properties cannot therefore approach those of long-fibre pulps, but research on the possibility of using Broom pulp in the furnish with other pulps is recommended.

2048. OVERBECK, W. Über die Ermittlung der wahren Verluste an Cellulose und Holzzucker beim Zellstoff-Aufschluss von Buchenholz. [**On the determination of the true losses of cellulose and wood sugar during the pulping of Beech wood.**] *Angewandte Chemie, Weinheim* 61*A* (5), 1949 (219–23). 6 refs. [G.] D.S.I.R.

The losses of cellulose and wood sugar during prehydrolysis and the sulphate cook, and during the sulphite process, are given in graphs and tables.

2049. ERDTMAN, H. **Nature of the sulphite pulping reaction.** *Tappi, Easton, Pa.* 32 (2), 1949 (75–7). [Kungl. Tekniska Högskolan, Institutionen för Organisk Kemi, Stockholm.] L.S.

The chemistry of the sulphite pulping process is discussed in its relation to the sulphonation of lignin. In the first stage of sulphonation a solid insoluble lignosulphonic acid of very large molecular weight is formed; further sulphonation under more acid conditions causes cleavage of acetal linkages connecting lignin molecules or lignin and carbohydrate molecules with simultaneous substitution of the hydroxyl groups thus liberated, by sulphonic acid groups. This results in the formation of soluble, relatively low-molecular lignosulphonic acids. The constitution of lignin and its reactions are discussed.

2050. PEW, J. C. **Douglas Fir heartwood flavanone: its properties and influence on sulphite pulping.** *Tappi, Easton, Pa.* 32 (1), 1949 (39–41). 7 refs. L.S.

[Cf. *For. Abstr.* 10 (No. 1114).] Some properties of the 3, 3′, 4′, 5, 7-pentahydroxyflavanone, a crystalline compound found in Douglas Fir heartwood, and means of isolating it, are described. Pulping studies using chips of extracted and unextracted Douglas Fir heartwood, Douglas Fir sapwood, Spruce, Spruce with the flavanone added to the cooking liquor, and Spruce impregnated with the flavanone, indicate that the flavanone is an important factor in sulphite-pulping resistance; the phenols tend to form insoluble phenol-lignin compounds. The low permeability also hinders pulping by retarding penetration, restricting normal diffusion of chemicals in the chips, and maintaining the soluble phenols at high concentration in the chips. Apparently Douglas Fir heartwood reacts normally to sulphate pulping, although the phenolic substances have been found to react with lignin in alkaline as well as acid solutions. The fact that the flavanone can be changed to a variety of highly-coloured substances suggests, however, that the high bleach requirement of Douglas Fir sulphate pulps may be partly due to the flavanone.

2051. PERRY, H. J. **Neutral sulphite semichemical pulping process.** *Paper Industry and Paper World, Mount Morris, Ill.* 31 (2), 1949 (210–3). L.S.

The neutral sulphite semichemical process, which is described fully, gives better results than any other process for pulping hardwoods. Figures are given to show the comparative properties of Birch and Aspen pulps from different processes and of unbleached Spruce sulphite. The Aspen pulp equals Spruce sulphite in bursting and tensile strength, but not in tearing strength, and is inferior in all properties to northern Spruce kraft. Unbleached neutral sulphite semichemical pulps are suitable for coarse paper and boards, and the bleached pulps have excellent colour and other properties and can be used for fibre papers. The pulps can be used very satisfactorily in mixtures with coniferous pulps. An experimental run consisting of Birch neutral sulphite semichemical 35%, Birch groundwood 20% and Jack Pine groundwood 45%, gave a paper comparing favourably, except in oil absorption (which can be corrected), with commercial newsprint.

2052. EVANS, J. C. W. **Abitibi's new pulp process.** *Pulp Paper Mag. Can.* 50 (9), 1949 (65–9).

A description of the pulping mill at Sturgeon Falls, Ont., now producing corrugated board by the new pulping process, the so-called neutral sulphite semi-chemical process, in which a mixture of soda ash and sodium sulphite is used. [Cf. *For. Abstr.* 11 (No. 1291).]

2053. **Day process.** *Papeterie, Paris* 71, 1949 (123, 125, 127). *Chem. Abstr.* 43 (14), 1949 (5590). P.R.

The HNO_3 processes are reviewed and new experimental data are given on HNO_3 pulping of Chestnut (without preliminary tannin extraction) and Birch. Yields and strength tests were entirely satisfactory and the α-cellulose contents were high. Beating before the papermaking operation is unnecessary. The Day process also permits a saving in cost of chemicals.

2054. **Kamyr's continuous cellulose cooking process.** *Transl. For. Prod. Aust.* 1949. pp. 6 + 2 dgms. Transl. by G. L. Amos from *Svensk Trävarutidn.* 1948 (206–9). P.R.

2055. PERRY, H. J. **Trends in the manufacture of groundwood.** *Tappi, Easton, Pa.* 32 (2), 1949 (67–70). L.S.

Discusses the use of new species, costs, and present equipment and methods.

2056. SCHØPP, P. L. Tekniske nyheter innen tremasseindustrien. [**Technical innovations in the groundwood pulp industry.**] *Norsk Skogind.* 3 (10), 1949 (248–54). [Nor.e.] P.R.

Describes with diagrams: a Swedish apparatus for creating a current in still water for transporting and floating wood to the conveyor; the American ring-type hydro barker; a Norwegian wood splitter; and American, Canadian and Norwegian grinders and screens. [Cf. *For. Abstr.* 11 (No. 2040).]

2057. FRANKLIN, J. N. **Instrumentation of the groundwood pulping process.** *Pulp Paper Mag. Can.* 50 (9), 1949 (92–9).

A brief account of equipment used in groundwood pulping with descriptions of recording and controlling instruments and some suggestions for their development.

2058. HOLLAND, W. W. **The manufacture of groundwood for newsprint.** *Tappi, Easton, Pa.* 32 (5), 1949 (220–1). L.S.

Mechanical pulping, screening, and refining equipment are described and the selection of pulpstones to suit the wood condition and the paper-machine requirements is discussed. The inherent qualities of Spruce, Balsam, and Jack Pine (the 3 main species used for pulping in Eastern America) can only be brought out by grinding separately and with the correct pulpstone. Whatever the species used, it should not be below 40% in moisture content. Age of wood since cutting is also a factor and wood should be used from piles in rotation.

2059. **Relationship between chemical composition and grinding properties of Eucalypt wood.** *Rep. For. Prod. Aust. 1948–9*, 1949 (15).

Samples of poor grinding wood contained 80–83%, and good grinding samples 72% holocellulose, a value rather low for *E. regnans.* The good grinding wood was from old trees (over 250 yrs.) and it is possible that an ageing effect on the less resistant carbohydrate fraction of the wood is responsible for the lower holocellulose content.

2060. KINGSBURY, R. M., SIMMONDS, F. A., and LEWIS, E. S. **Bleaching groundwood pulps with hypochlorites.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1736, 1949. pp. 7 + 4 tbls. 7 refs. P.R.

Calcium hypochlorite is a satisfactory bleaching agent for hardwood, but probably not for softwood pulps.

2061. CRAIG, K. A. **The use of various Poplar mechanical or groundwood pulps containing rot in high-grade book paper.** *U.S. Patent* No. 2,474,034, June 21, 1949. *Chem. Abstr.* 43 (17), 1949 (6826). P.R.

Poplar mechanical or groundwood pulps have not been used, since they contain a high % of internal decay or rot caused by fungi, which make the pulps specky and dirty; the cost of sorting out the rot would be prohibitive. Such rot-containing pulps were made usable when subjected to an initial alkaline hypochlorite bleach followed by an acid treatment. 1,236 tons of rot-contaminated pulp, treated with 378·2 tons Ca $(OCl)_2$ and 58·7 tons NaOH gave 1,198 tons of washed, bleached pulp. Brightness and fibre strength were satisfactory.

2062. BADE, O. M. Kjemikaliebehandling av tremasse for å hindre soppskader. [**Chemical treatment of mechanical pulp to prevent fungus damage.**] *Meddelelse fra Papirindustriens Forskningsinstitutt, Oslo* No. 23, [1948]. pp. 5. [Nor.e.] *Repr.* from *Norsk Skogind.* 1948 (8). L.S.

2063. SHEMA, B. F. **Preservation of groundwood pulp during storage.** *Tappi, Easton, Pa.* 32 (5), 1949 (227–8). [Institute of Paper Chemistry, Appleton, Wis.] L.S.

Results of a mill trial of Santobrite and Lignasan showed that not less than 0·14% by weight of Santobrite must be retained by the pulp; results for Lignasan are inconclusive. *From author's summary.*

2064. GADD, G. O. **Fungal damages in groundwood pulp.** *Pulp Paper Mag. Can.* 50 (11), 1949 (98–9). 9 refs. [Central Laboratory, Helsingfors Biochemical Department.]

Some additional information on storage damage to groundwood pulp [cf. *For. Abstr.* 11 (No. 471)] based on experiments made at the Research Institute of the Finnish Woodworking Industries. Yeasts and moulds do not appear to affect groundwood pulp properties to any considerable degree. Rot fungi, however, such as *Lentinus lepideus*, *Lenzites sepiaria*, *Paxillus panuoides*, *Pholiota mutabilis*, *Peniophora gigantea*, *Stereum sanguinolentum*, *Polystictus abietinus*, *Corticium evolvens* and others, stain the pulp and render it acid and difficult to break up. After long storage, the pulp becomes brittle and the weight per sq. m. decreases. The decomposition, however, is a slow process and is directly proportional to storage time at a constant temperature. Fungal decay does not occur in 75%-air-dry pulp.

33.32.3. *Wallboards, Fibreboards, etc.*

See also *For. Abstr.* 11 (Nos. 1854–5, 1959).

2065. HARSTAD, F. L. **The wallboard industry in U.S.A. and Canada.** *Transl. For. Prod. Aust.* 1949. pp. 21. Transl. by E. Selman-Towt from *Norsk Skogind.* 1 (11), 1947 (279–87). P.R.

2066. MÖRATH, E. Die Holzfaserplatte. **[Wood fibre boards.]** *Repr.* from *Jahrbuch der Holzschule für Bodenkultur in Wien* 2, (1948) 1949 (276–87). [G.] P.R.

Describes methods of manufacture of different fibreboards, and their properties.

2067. **Building materials.** *Rep. For. Prod. Aust. 1948–9*, 1949 (31).

Satisfactory dimensional stability and bending strength of a sawdust/synthetic-resin board (comparable with a good-quality hardboard) was obtained with a medium-grade sawdust (14–22 mesh) in association with a finely ground resin, after pressing at a temperature of *ca.* 400° F. and a pressure of *ca.* 500 lb./sq. in. for 10–12 minutes. In these conditions fully cured material has a density approximating to 60 lb./cu. ft.

2068. ÖGLAND, N. J. **Hot-air treatment of hard-board.** *Transl. For. Prod. Aust.* 1949. pp. 6 + 4. 6 refs. Transl. by C. W. Wouters from *Norsk Skogind.* 2, 1948 (301–5). P.R.

Heat treatment of hardboards at temperatures above 160° C. gives higher bending strength, lower water absorption and lower swelling tendency in damp air and water than at lower temperatures; the treatment is also more rapid and less costly. The danger of self-ignition, which is greater at high temperatures because of the exothermic reaction involved, can be controlled by allowing air to play freely on the boards, thus removing the heat developed. The effect of the heat treatment seems to be due mainly to a change in the properties of the hemicellulose.

33.33. Manufacture of Textiles and Cellulose Derivatives from Wood

2069. HAAS, H. Vergleich des Quellungs- und Lösungsmechanismus von Buchen- und Fichtenzellstoffen bei der Viskose-Herstellung. **[Comparison of the swelling and solution mechanism of Beech and Spruce pulps during the formation of viscose.]** *Papier, Darmstadt* 2 (21/22), 1948 (397–401). 14 refs. [G.g.] B.P.I.R.A.

The reaction of Beech pulp after the addition of CS_2 at the start of xanthation is much slower and less uniform than that of Spruce. As the amount of CS_2 available during the process is considerably less than can be taken up by the cellulose molecules, the fibres that react more quickly will take up CS_2 at the expense of the unswollen fibres; these latter form the undissolved residue which hinders the filtration process. The stages of the xanthation process for the 2 pulps are shown in photographs.

33.36. Wood Finishes. Preservation of Wood. Seasoning and Drying

2070. JIRU, P., and ILLE, R. Conservation des bois. **[Wood preservation.]** *Proc.*

World For. Congr. No. 1, 1949 (197–207). [F.e.]

Reviews the principal methods and substances at present used for wood preservation.

2071. SUOLAHTI, O. **Review of the development of timber preservation in Finland.** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (36–8).

2072. SAINT-GERMAIN, J. La protection des bois par les peintures à l'aluminium. **[Protection of wood with aluminium paints.]** *Revue de l'Aluminium, Paris* 26 (153), 1949 (75–8). [F.] L.S.

Presents results obtained at Madison and at the Laboratoire National du Bois, Paris, showing the reduction in hygroscopicity obtained from treatment with aluminium and other paints.

2073. **Nomenclature and definitions of wood preservatives and wood coatings.** *American Paint Journal, St. Louis* 33 (4), 1948 (38, 40, 42–3).

Defines the terms: (1) N.S.P. [non-swelling paintable] water-repellent for wood; (2) wood sealer; (3) N.S.P. preservative for wood; (4) preservative wood sealer; and (5) N.S.P. water-repellent preservative for wood, adopted by the Preservative Standards Advisory Committee of the National Door Manufacturers' Association.

2074. LABERGE, R. W., and PANSHIN, A. J. **A study of some factors affecting determination of water repellency in treated wood.** *Quart. Bull. Mich. agric. Exp. Sta.* 32 (1), 1949 (166–74).

Studies were made in order to determine:—(1) the effect of size of sample and length of treating period on the absorption of a water repellent by the samples; (2) the effect of specific gravity of wood on the % of absorption of a water repellent; and (3) the effect of varying sample size and length of treating period on the efficiency of a repellent. The results indicate that:—(*a*) Absorption is directly correlated with the specific gravity of wood. (*b*) The % absorption of a repellent is affected by the temperature of the wood and the repellent solution as well as by the moisture content of the wood. Conditions of samples and treating solution should, therefore, be standardized in relation to these factors. (*c*) Greater absorption of repellents can be obtained where a solution is agitated. (*d*) Rapid absorption of a water repellent occurs as soon as dry wood comes into contact with the solution. About 60% of total absorption takes place during the first hour of dipping. (*e*) Increase in length of samples from 2 to 3 in. results in an appreciable decrease in the % of absorption. Increase in the sample length beyond 3 in. produced further decrease in % absorption, but at a much slower rate. This was due largely to the effect of end-grain penetration, which becomes less important as sample length increases. (*f*) After immersion in a water bath, the average dimensional changes of untreated control samples increased with increase in sample length, while those of treated samples decreased. Average changes in dimensions for both treated and untreated samples were greater for the first 2 hours of immersion than for the following 4 hours. (*g*) Varying the treating time from 15 seconds to 1 hour had relatively little effect on the subsequent water-repellent efficiency for any given sample-length group.

It is concluded that in developing a testing technique for evaluation of the efficiency of a water-repellent, special attention should be paid to the specific gravity and the length of the test samples. Standardization of moisture content of samples, and temperature of wood and solution, is also desirable. *From author's summary.*

2075. SWANN, M. H. **Determination of fungicides in varnishes and wood sealers.** *Analyt. Chem.* 21 (7), 1949 (804–6). 6 refs. P.R.

2076. BROWNE, F. L. **Moisture content of wood as related to finishing of furniture.** *Rep. U.S. For. Prod. Lab., Madison* No. *D*1722, 1947. pp. 7 + 2 gphs. P.R.

Moisture content of the wood within the limits permitted in furniture manufacture has little significant effect on the finishing. Most finishes have a protective effect by slowing down the passage of moisture in or out of wood. Results of service tests on the moisture content of woods with different finishes in different conditions of air humidity are shown in graphs and tables.

33.36.1. *Preservation against Attack by Plants and Animals*

See also *For. Abstr.* 11 (Nos. 1902, 1906–9, 1959, 1987, 2062–3, 2134, 2225).

2077. **Wood preserving statistics [for the U.S.A.] for 1948.** *Wood Pres. News* 27 (10), 1949 (129–31). P.R.

2078. Usina-pilôto para tratamento de madeira. Ante-projecto elaborado pelo Instituto de Pesquisas Tecnológicas de São Paulo, para o Instituto Nacional do Pinho. **[Pilot plant for wood preservation. Design drawn up by the Instituto de Pesquisas Tecnológicas de São Paulo for the Instituto Nacional do Pinho.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (255–9). [Port.] P.R.

2079. **Code of practice for the application of timber preservatives.** Standards Council, Pretoria. No. S.A.B.S.05, 1949. pp. 15 + 16. [E.Afrik.] [South African Bureau of Standards, Pretoria.] Price 5*s*. P.R.

2080. Die geprüften Holzschutzmittel Deutschlands (Stand vom 1. Mai 1949). **[Tested wood-preservatives in Germany (on May 1, 1949).]** *Weltholzw.* 1 (1), 1949 (180–2). [G.] P.R.

Lists commercial preservatives, with the manufacturer's name and address, indicating their effectiveness as insecticides, fungicides and fire-retardants and their suitability for interior or exterior work.

2081. Rose, A., and Hutchison, A. W. **Physical and chemical properties of Quartermaster fungicide compounds [G.4, pentachlorophenol, tetrachlorophenol, and copper-8-quinolinolate]. Summary report July 1, 1947 to December 31, 1947.** Pennsylvania State College, State College, Pa. 1947. pp. 71 + 7 gphs. Numerous refs. P.R.

2082. Baechler, R. H. **Process for treating wood.** *U.S. Patent* No. 2,469,427, May 10, 1949. pp. 2. 8 refs. P.R.

A solution containing Ni salts, a soluble arsenate, and a soluble dichromate, when applied to wood, deposits in it a toxic material of low solubility that will more or less permanently protect the wood from decay and insects. This, unlike a similar treatment where Cu instead of Ni salts are used, does not increase the wood's combustibility.

2083. Sandstrom, S. **Wood preservation with the Boliden salt preservative.** *Repr.* from *S. Afr. Timb. Tr. J.* 2 (7), 1948. pp. 11. 2 refs. P.R.

Gives tables showing the results of experiments on the resistance to decay and attack by termites and marine borers of timbers impregnated with Boliden salts; also figures showing the expansion in use of Boliden salts in Sweden since 1936.

2084. Høner, F. G. **Preserving wood by impregnation.** *Swiss Patent* No. 237,229, Jan. 3, 1946. *Chem. Abstr.* 43 (15), 1949 (5900). P.R.

A mixture containing 1 g. rotenone, 1 g. CS_2, 8 g. chloroform, 50 g. drying agent, 190 g. paraffin oil, 250 g. turpentine and 500 g. linseed oil gave a clear, highly viscous fluid, which could be used for immersion, painting or spraying. Mineral or aniline dyes could be added to the mixture. Extracts from plants containing rotenone or tubain could be used in place of rotenone. Such mixtures protect against insects, fungi, bacteria and water damage.

2085. **Preservative treatment of sawn timber.** *Rep. For. Dep. Uganda 1948*, 1949 (23–4).

Figures are tabulated for absorption of preservative (lb./cu. ft.) after cold dips of 1 min., 5 min., and 24 hours respectively, and penetration obtained with the 24-hr. dip, for *Albizzia zygia*, *Alstonia congensis*, *Baikiaea minor*, *Celtis soyauxii*, *Chlorophora excelsa*, *Chrysophyllum albidum*, *C. perpulchrum*, *C.* sp. nov., *Maesopsis eminii*, and *Piptadenia africana*, with *Pinus echinata* for comparative purposes. The tests indicate that all the timbers examined, except *A. zygia*, *C. excelsa* and *P. africana* can be readily protected with a relatively short dip. The low absorption and penetration for *Albizzia* were unexpected.

2086. Japing, H. W., and Linden, P. J. van der. Vergelijkende proeven betreffende koude impregnering met voorvacuum en hete impregnering zonder vacuum. **[Comparative tests on cold impregnation with previous vacuum treatment and hot impregnation without a vacuum.]** *Rapp. Bosbouwproefsta. Buitenzorg* No. 15, 1949. pp. 6. [Du.du.e.] (Serie Houtverduurzaming No. 5.)

Results for a range of preservatives show that (1) heating the preservative to reduce its viscosity is not necessary at normal tropical temperatures; (2) vacuum treatment for 25 min. followed by cold soaking for 35 min. gives a significantly higher absorption of preservative than open-tank treatment for 3½ hrs. at 80° C., followed by cooling for ½ hour to 40° C.; (3) that a combination of heating and vacuum treatments gives only slightly better results than vacuum treatment alone. Results are tabulated.

2087. **The high pressure treatment of Eucalypt timbers.** *Rep. For. Prod. Aust. 1948–9*, 1949 (33–4).

Results of a 3-year investigation on the treatability of 47 Australian timbers, followed by a more detailed investigation on the penetration obtained by pressure treatment in 13 Eucalypt species, show that the majority of Eucalypts can be penetrated reasonably well with creosote oil at pressures of up to 1,000 lb./sq. in. Further investigations will be made on pressure treatment of sleepers. [Cf. *For. Abstr.* 10 (No. 2089).]

2088. MATAGRIN, A. Méthodes nouvelles de protection des bois d'oeuvre. Protection du bois abattu contre les insectes. **[New methods of protecting timber. Protection of felled timber against insects.]** *Rev. int. Bois* 16 (144/5; 146/7), 1949 (132–8; 157–62). 100 refs. [F.]

A review of new insecticides.

2089. GRIFFIOEN, K. De houtaantasting en haar bestrijding, enige grepen uit een studierapport. **[Insect pests of wood and their control.]** *Tectona* 38 (3), 1948 (161–81). 36 refs. [Du.e.]

A survey of development of studies during the last 10 years, with particular reference to preservative treatment, in the form of a review of literature.

2090. ***Lyctus* investigations.** *Rep. For. Prod. Aust. 1948–9*, 1949 (34–5).

Further tests have been made of the immersion and block stacking method [cf. *For. Abstr.* 10 (No. 2085)] with good results. Another method, the addition of toxic chemicals to the glue used in bonding plywood, shows promise, especially for Gammexane, which has completely prevented attack even at low concentrations. Studies have been started on the nutritional requirements of *Lyctus brunneus*.

2091. HARRIS, W. V. **Report on a trial with DDT and BHC for the protection of timber against termites.** *E. Afr. agric. J.* 14 (1), 1948 (49–50). 3 refs.

A trial was carried out over a period of 17 months in termite-infested land at the Agricultural Research Station, Kawanda. Slabs of a susceptible local timber (*Maesopsis eminii*), were completely protected by all ten formulations of DDT and 666 (BHC), while of 8 untreated slabs, 6 were more than half eaten and only one remained undamaged. Creosoted boundary posts were also damaged. Treatments consisted in dipping for a few minutes in 5% DDT solution or emulsion, 5% 666 oil solution, or 1% aqueous dilution of a Gammexane miscible oil.

2092. HARRIS, W. V. **Further notes on the protection of timber against termites.** *E. Afr. agric. J.* 14 (4), 1949 (187).

A further report on the project described in the preceding abstract. On Jan. 30, 1948, the 80 treated slabs of *Maesopsis* timber, together with 8 new controls, were buried at random in a new graveyard site, and left for 10 months, making a total of 27 months for the treated slabs. The site had been mulched with wood shavings and watered at intervals to encourage the free movement of termites during unusually dry weather in March, and this had apparently favoured rot fungi despite the DDT or 666 treatments. With a timber such as *Maesopsis*, a fungicide would require to be added to the formulation to give complete protection.

2093. WOLCOTT, G. N. **The compounds of copper most effective in making wood resistant to the attack of the West Indian dry-wood termite, *Cryptotermes brevis* (Walker).** *Carib. For.* 10 (3), 1949 (197–203). 3 refs. [E.Span.]

Compares and discusses the effectiveness of various Cu compounds in making wood resistant to attack by *Cryptotermes brevis*. Experiments were made with $CuSeO_4$, Cu and Zn selenites and Cu and Zn tellurites, all of which needed H_2SO_4 to get them into solution. Neither Zn compound proved as repellent as $ZnCl_2$, the Cu compounds were scarcely more effective than $CuSO_4$, and all the compounds

are dearer than the more usual ones. Their insolubility in water, however, probably prevents leaching.

2094. MAHON, R. C. **Timber treatment cuts costs.** *Mining Engineering, New York* 1 (1), 1949 (26–7). N.C.B.

In the Lake Superior district, mining timbers of Maple and Birch, substituted for the local Tamarack which blight had killed, were found to have good strength properties but to fail by decay after 3 years underground. Data from the Du Pont Chemical Co., the Madison Forest Products Laboratory and the Castile Mining Co. showed that a life of 15 years could be expected from hardwoods treated with chromated zinc chloride; this is preferable to treatment with creosote for ease and safety in handling. Costs of untreated timber are estimated at $57.50 per set and of treated timber at $14 over a period of 15 years. The trees are felled in March–April and left to dry until September, when the timber is cut to proper lengths. It is then left for 12 hr. in a tank of water maintained at 210° F., and next transferred to a tank containing a 10% solution of chromated zinc chloride and left for 12 hr.; this should give a penetration of 1½–3½ in. and an absorption of not less than 0·75 lb./cu. ft. Penetration is tested by colouring increment cores with iodine-potassium ferricyanide. The treated timber is allowed to dry for a month before use. A diagram shows the lay-out of the Homer-mine treating plant.

2095. BURT, C. S. *et al.* **Report of Committee 17—wood preservation.** *Bulletin [Proceedings] of the American Railway Engineering Association, Chicago* 50 (478), 1949 (359–418). L.R.R.S.

Reports of sub-committees include: (1) Tabulated results of service tests on treated wood on 4 American railways. [Cf. *For. Abstr.* 8 (No. 2595).] (2) Discussions of service tests of treated and control timbers exposed to marine-borer attack round the American coast. (3) Specifications and modifications of existing specifications for creosote/petroleum solutions. (4) Recommendations for control of termite damage. (5) Specifications for chromated zinc chloride, Tanalith, pentachlorophenol, and copper naphthenate, drawn up by the American Wood-Preservers' Association. (6) Tabulated results of the 1948 inspection of service tests to determine the effect of incising on checks and splits in mixed hardwood sleepers. Sleepers were graded into 3 groups: (*a*) checks less than ⅛ in. or none; (*b*) checks and splits ⅛–⅜ in.; and (*c*) checks and splits over ⅜ in. The inspection after 7 years in service showed that 25 of the 29 sleepers in group (*c*) were unincised. Incision did not appear to accelerate seasoning or increase penetration, but did increase retention of the preservative by ½ lb./cu. ft. of wood. (7) Progress reports of coal-tar treatment and fireproofing. (8) (*a*) When Southern Pine was pre-treated with phenyl-mercury-oleate the maximum air-seasoning period without sign of decay rose to 18 months, and with only slight decay to 24 months; (*b*) Southern Pine pre-treated with urea or with borax/boric acid showed in both cases slightly less checking after 4 months' seasoning than untreated controls; (*c*) Oak sleepers pre-treated with borax/boric acid showed slightly less checking after 6 months' seasoning than untreated controls. (9) A tabulated survey of treating practices on railways in U.S.A., Canada and Mexico. An appendix gives details and results of the vapour-drying process for Oak sleepers. [Cf. *For. Abstr.* 9 (Nos. 1758, 1761).]

2096. THOMAS, A. V. **The service life of sleepers in the Malayan railway.** *Malay. Forester* 12 (3), 1949 (114–23).

These tests show that the average life of a primary hardwood sleeper may vary from 11 to 17 years according to species, but total replacements before the war indicate an average life of only 12 years for all species. *Koompassia malaccensis, K. excelsa, Dipterocarpus* spp. *Shorea curtisii* and *Hopea sulcata*, pressure-impregnated with a mixture of equal quantities of creosote and diesel fuel, have lasted so well that their average serviceable life will be at least 20 years. The results from sleepers treated by the open-tank process are less satisfactory, because absorption is not generally quite so good nor is penetration so thorough. Nevertheless a life of 16–18 years may be expected. Sleepers impregnated with water-soluble salts have not proved so durable as those treated with creosote and diesel fuel mixtures.

2097. BÅNG, F. Ett nytt virkessortiment: ledningsstolpar av gran. **[A new timber assortment: Norway Spruce transmission poles.]** *Skogen* 36 (18), 1949 (242). [Sw.]

AB Antros, of Stockholm, have for several years marketed a preservative known as Antrosol for osmotic-diffusion-type impregnation of green timber, which is said to make possible the use of Spruce for transmission poles. About 7 kg. of the preservative are needed per cu.m. of timber. After the actual (brush) treatment, the poles must be stored for 3 months before delivery. An editorial note adds that the effective constituent is probably similar to the German Basilit UA salt.

2098. WALTERS, C. S., and KULP, D. A. **The seasoning and cold-soak preservative treatment of Water Tupelo [*Nyssa aquatica*] fence posts.** *For. Note Ill. agric. Exp. Sta.* No. 5, 1949. pp. 2.

2099. GUNDERSON, W. R. H. **Home-treated fence posts serve well.** *Tech. Notes Lake St. For. Exp. Sta.* No. 325, 1949. p. 1. Fence posts of *Populus tremuloides*, *Ulmus americana*, and *Acer saccharinum*, were treated, green and unpeeled, by the tyre-tube method with $ZnCl_2$, and after 6 years' service were all sound.

2100. KIELHÖFER, E. **Keeping qualities of vineyard stakes.** *Weinbau* 2, 1947 (292–3). *Chem. Abstr.* 43 (16), 1949 (6351–2). P.R.

After a 12-year test period to determine the value of various methods of impregnating vineyard stakes, 53·6% of the untreated stakes had rotted off; 8·1% were completely useless. Thorough creosoting gave the best result, with no loss after 12 years; when the creosoting was done in an open kettle, the loss was 0·9%. The loss was 2·7% for stakes first dried and then kyanized, and 4·5% for stakes impregnated with $CuSO_4$. When the stakes were kyanized without previous drying, 9·1% rotted off. Drying before kyanizing is therefore essential. No differences were noted between different wood species.

2101. RHOADS, A. S. **Decay in Balsa life floats and the value of brush and dip treatments with chlorinated phenol for its prevention.** *Journal, American Society of Naval Engineers, Inc., Washington, D.C.* 60 (4), 1948 (565–95). 19 refs. L.S.

Observations on floats of Balsa stored out of doors showed that they had been severely attacked by different rot fungi and moulds; the canvas coverings had apparently been ineffective in preventing absorption of moisture by the wood. Moisture determinations showed an average moisture content of 47·7%; only 25·6% of the floats gave readings averaging below 25% and only 12·8% gave no readings above 24%. Dip and brush treatments with chlorinated phenol gave good protection against test fungi. Buoyancy of the floats was not seriously decreased and the shear strength of glue joints was only reduced when water repellents were included in the preservative solution. The following recommendations are made: a 5-minute dip treatment should be given after cutting and milling, but before gluing, in a 5% solution of chlorinated phenol; pieces should be allowed to dry at least over night before gluing; and after final shaping and sanding the floats should be given another dip treatment, the chlorinated phenol solution of the final dip containing water-repellent ingredients.

33.36.2. *Fireproofing*

2102. BRYAN, J. **Protection of wood against fire.** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (27–8).

Deals with the factor influencing burning and the mechanism of its control.

2103. PERINCIOLO, M. **Fireproof wood, fabrics, etc.** *Ital. Patent* No. 427,709, Nov. 26, 1947. *Chem. Abstr.* 43 (20), 1949 (8138). P.R.

The material is first treated with air at 90° C., then in autoclave with a mixture of $(NH_4)_3PO_4$ 5–15, Na tungstate 9–12, NH_4OH 35–25, $MgCl_2$ 22–24, $MgSO_4$ 17–6, and $(NH_4)_2SO_4$ 12–18% by raising pressure and temperature to 100°, and is finally dried first in the same autoclave *in vacuo* and then in the air at 50°.

2104. ANGELL, H. W., GOTTSCHALK, F. W., and MCFARLAND, W. A. **Ignition temperature of fireproofed wood, untreated sound wood, and untreated decayed wood.** *B.C. Lumberm.* 33 (9), 1949 (57–8, 70, 72).

A test method was evolved and investigations were made on the ignition point of:—(1) wood, pressure-treated with 3 different commercial fireproofing compounds, (2) untreated sound wood, and (3) untreated decayed wood. The ignition test was made by subjecting test specimens to sudden predetermined temperatures. From the data obtained the following conclusions were drawn:—(1) Upwards of 3 lb.

of dry chemical per cu. ft. are needed to raise the ignition temperature above 1,200° F., and more than 4 lb. to raise it above 1,300° F. Retentions of 1 lb. or less of fire-retardant chemical bring about no increase of ignition temperature. (3) Untreated Southern Pine and untreated Redwood have about the same ignition temperature. (4) Untreated decayed wood ignites at a much lower temperature than similar sound wood.

33.36.3. *Seasoning. Drying*

See also *For. Abstr.* 11 (Nos. 1898, 1974, 2003, 2095, 2134).

2105. Brotero, F. A. Secagem de madeira em estufa. **[Kiln drying of wood.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (71–107 + 1 dgm.) 19 refs. [Port.] P.R.

General principles of wood seasoning, with shrinkage figures (radial, tangential and volumetric) for 94 Brazilian species, and the theory of kiln drying, with practical recommendations and descriptions of apparatus.

2106. Japing, H. W. Ovendroging van hout. **[Kiln drying of wood.]** *Vlugschr. Bosbouwproefsta. Buitenzorg* No. 3, 1949. pp. 8. [Du.] (*Serie Houtdroging* No. 1.) P.R.

2107. Séchoirs Ventil. (I) Séchoir type discontinu à cellule. (II) Séchoir continu. **[Ventil kilns. (I) Compartment type kiln. (II) Progressive kiln.]** *Rev. Bois Appl.* 4 (9/10; 11), 1949 (40; 42). [F.]

Describes, with illustrations, the compartment and progressive kilns of the Ateliers Ventil, giving particulars of construction and output.

2108. Eisenmann, E. Künstliche Schnelltrocknung mit Temperaturen über 100° Celsius. **[Rapid kiln seasoning at temperatures of over 100° C.]** *Holztechnik* 29 (8), 1949 (151–5). 4 refs. [G.] P.R.

Seasoning at high temperatures and air humidities is practicable for both softwoods and hardwoods. The seasoning time is considerably reduced. Pine seasoned by this method showed only 30% of the shrinkage and swelling of air-dried Pine under the same service conditions. Graphs show the comparative times of seasoning by normal and by high-temperature methods for softwoods and hardwoods, and figures are given for examples of seasoning Beech in commercial practice.

2109. **Kiln-drying schedules.** *Suppl.* to *Leafl. For. Prod. Res., Lond.* No. 42, 1949. pp. 2.

[Cf. *For. Abstr.* 10 (No. 540).] Lists some 65 species, giving the kiln-drying schedule recommended for each.

2110. **Kiln drying.** *Rep. For. Prod. Aust. 1948–9*, 1949 (29–30).

Schedules have been developed for quarter- and backsawn stock of Brown Stringybark [*Eucalyptus baxteri*, *E. blaxlandi* and *E. capitellata*], White Stringybark [*E. eugenioides*] and Silver-top Ash [*E. sieberiana*], species hitherto little used for joinery purposes because of their refractory behaviour in seasoning. For backsawn stock particularly, pre-treatment with NaCl reduced checking. Work on developing drying schedules for Klinki Pine and Ramin (*Gonystylus* sp.) was begun.

2111. Loughborough, W. K. **Chemical seasoning: its effectiveness and present status.** *Rep. U.S. For. Prod. Lab., Madison* No. *D*1721, 1948. pp. 13 + 4 photos, 4 gphs., 3 tbls. 1 ref. P.R.

The use of different chemicals is discussed and the relative humidity of air in equilibrium with vapour pressure of saturated solutions is given for 8 chemicals: furniture exposed to relative humidities averaging less than 70–75% can safely be treated with NaCl (equilibrium at 78% relative humidity) but not with $CaCl_2$ (32%). In general, the more soluble and bulky chemicals have the greatest anti-shrink effect, and it may be desirable to use 2 chemicals (e.g. a mixture of salt and invert sugar) to increase the effect. Tests on Yellow Birch and Persimmon squares soaked in buffered urea-aldehyde solution showed a significant increase in hardness in the treated specimens. Buffered urea aldehyde also improves the finishing qualities of the wood. Urea combines with lignin in hardwoods to form a thermo-plastic. Several chemicals (e.g. urea, borax, buffered NaCl and buffered urea aldehyde) increase the resistance of the wood to decay. Tests were made on the corrosiveness of 32 chemicals and mixtures of chemicals; boards treated with $(NH_4)_2HPO_4$ and 2% $K_2Cr_2O_7$, $Na_2Cr_2O_7$, $Ca(NO_3)_2$, K_2SO_4 and 2% $K_2Cr_2O_7$ and borax were all less corrosive to nails than untreated

boards, but NaCl and $(NH_4)_2SO_4$ were seriously corrosive; organic compounds are not as a rule corrosive. Salts should not be used for seasoning where high electrical insulation is required, as they materially reduce the electrical resistance of the wood. The only chemicals to meet the requirements of cheapness, equilibrium with about 75% relative humidity, non-corrosiveness and complete solubility in water, are buffered NaCl, buffered urea aldehyde and, for some uses, urea. Information on drying schedules for different species and chemicals is given. It is considered unlikely that chemical seasoning will be widely used at present, because of its higher cost.

2112. Barksdale, B. E. **Apparatus for drying lumber.** *U.S. Patent* No. 2,464,429, Mar. 15, 1949. pp. 2 + 2 dgms. 7 refs. P.R.

The apparatus, which consists of a tank having an open end, with rails on the bottom to hold a truck to carry the timber being dried, an outlet and an inlet pipe, steam coils, and temperature and pressure controls, is described in detail with illustrations. A truckload of timber is placed in the tank and anchored to it to prevent floating. The tank is then filled with a mineral fluid preferably of high paraffin content; its temperature must not differ by more than 20° F. from that of the wood, or fluid may penetrate the wood. The tank is sealed, and the temperature of the fluid raised to 250° F. and maintained at that point for a time varying with the size of the timber. The drying fluid is then drained rapidly from the tank, the temperature being still maintained to prevent the fluid from entering the wood. The wood is then ready for removal and manufacture. The drying fluid can be used repeatedly.

2113. **Collapse.** *Rep. For. Prod. Aust. 1948–9*, 1949 (9).

Collapse during seasoning of *Eucalyptus regnans* develops very rapidly in the early wood, and at one stage of drying the tangential contraction of the early wood is approximately 1·7 times that of late wood.

2114. **Veneer drying.** *Rep. For. Prod. Aust. 1948–9*, 1949 (28–9).

[Cf. *For. Abstr.* 10 (No. 1992); 11 (No. 1974).] Laboratory work has shown that the primary cause of degrade in drying Ash-type Eucalypts is collapse, which acts differentially between late and early wood. Extent of collapse is chiefly a function of the wet-bulb temperature, and is independent of the dry-bulb temperature; checking increases with drying time, so a high dry-bulb temperature is desirable for rapid drying. Results so far indicate that a dry-bulb temperature of 150° F. and a wet-bulb temperature of 110° F. are optimum conditions. Peeling technique influences drying behaviour, and reconditioning results in a 6–12% recovery in width and the virtual removal of buckling and wrinkling.

33.37-8. Destructive Distillation. Charcoal and By-Products. Use of Wood and Charcoal for Gas Manufacture

2115. Hellström, N. **On distillates from wood.** *Handl. K. tekn. Högsk.* No. 4, 1947. pp. 15. 36 refs. [E.e.] Price *Kr.* 1. L.S.

A study of the chemical composition of soluble wood tar from softwoods.

2116. Hellström, N. **On distillates from Fir stumps. Part I. Fir tar and oils from Fir tar. Part II. Neutral substances present in Fir tar and oils from Fir tar.** *Acta Polytechnica, Stockholm* No. 33, 1949. pp. 53. [E.e.] Price *Kr.* 3.50. Also in *Handlingar, Kungl. tekniska Högskolan* No. 21, 1948. D.S.I.R.

Oven tars from 'Fir' [*Pinus sylvestris?*] stumps and oils from such tars were examined to obtain further particulars of their quantitative composition. Special attention was directed to the rosin acids comprised in the tars and to the hydrocarbons contained in the oils. Results are given in graphs and tables.

2117. Dimitri, M. S., Jongedyk, R. P., and Lewis, H. C. **Distillation of fluidized hardwood.** *Chemical Engineering, Albany, N.Y.* 55 (12), 1948 (124–8). 8 refs. L.S.

In hardwood distillation by the fluidized-powder method, sawdust or powdered wood is heated while it is suspended in a stream of hot non-oxidizing gas. A conventional recovery system separates tar, acetic acid, methanol and other products from the outlet gas. The residual powdered charcoal, which amounts to about ⅓ of the total weight of the wood, is a promising raw material for activated carbon. In experiments, Red Oak was fluidized in

nitrogen gas; the apparatus is described and sketched, and the yields are shown in graphs and a table. Yields of acetic acid and methanol from a run of 100 minutes at 385° C. are each 8·1% by weight (based on the dry wood) as against the reported yields of 6·82% total acid and 2·25% methanol from steam distillation of Red Oak to a final temperature of 400° C. in laboratory conditions and 4·70 and 2·2% in commercial conditions [see *For. Abstr.* 5 (126–7)]. A study of the rate of distillation by the fluidized-powder method shows that after initial rapid distillation the rate of production of volatile products drops gradually, and suggests that higher yields may be obtained from longer periods of distillation. The distillation can be completed in a very much shorter time than by the ordinary kiln method; in the run at 385° almost ⅓ of the total acid yield was produced in the first 10 minutes and the total run took less than 2 hrs. as against runs of 10–30 hr. in commercial steam distillation. Further experiments are planned.

2118. VILA, A. Étude de l'huile de goudron de bois feuillus et de ses applications. **[Study of tar oil from hardwoods and its uses.]** *Peintures, Pigments, Vernis, Paris* 24 (10), 1948 (307–10). [F.] [Laboratoire des Goudrons du Centre National de la Recherche scientifique, Bellevue (S.-et-O.)] L.S.

The steam distillation of the oil, at steam temperatures ranging from 105 to 150° C., and refining methods, are described and its chemical composition is discussed. Among its uses are: as diesel fuel and as a lubricant; for the impregnation of wood and as an insecticide carrier; in the preservation of fish and meat: in printers' inks and varnishes. Some formulae for varnishes are given.

2119. HUGHES, F. **A metal-lined pit charcoal kiln.** *E. Afr. agric. J.* 14 (1), 1948 (53–4).

A simple but effective charcoal kiln can be made from the steel bodies of 3-ton and 5-ton military lorries. The method of construction and operation are described.

2120. BOBKOV, N. P. O vliyanii vlazhnosti gazogeneratornogo topliva na moshchnost' dvigatelya. **[Influence of the moisture content of gas-generator fuelwood on motor power.]** *Lesn. Prom.* 1949 (5), (22). [Russ.]

In the study here briefly reported it was found that the species of wood used [not specified] had no practical influence on the motor power developed, which depends primarily on the moisture content of the fuel. Data are graphed and tabulated for Birch billets of 10–54% absolute moisture content. Maximum power (44·5 h.p.) was developed with billets of 10% moisture, decreasing with increasing moisture content to 25 h.p. at 50% moisture.

2121. IMADA, F. **Studies on carbon. I. Activation of amorphous carbon and preparation of active charcoal [from hardwoods and softwoods]. II Sorption isotherm of charcoal and the mechanism of its activation. III Activation of charcoal [from *Quercus acuta*]. IV Preparation of active charcoal [from hardwoods]. V–VII Effect of activation of charcoal on chemical reactivity. VIII–XII Sorption of oxygen from active carbon.** *Technol. Repts. Kyushu Imp. Univ.* 18, 1943 (47–96; 201–7; 242–56). *Chem. Abstr* 43 (14), 1949 (5571–2). P.R.

33.39. Manufacture of Sugar, Oils, Alcohol, and Miscellaneous Chemical Products from Wood

See also *For. Abstr.* 11 (Nos. 1888–94, 2020).

2122. HARRIS, E. E. **Derived products and chemical utilization of wood waste.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–10, 1949. pp. 10. P.R.

Describes the process of wood hydrolysis and discusses uses of wood carbohydrates, lignin (established uses, uses which have been investigated and may find limited practice, uses calling for further research) and extractives.

2123. SOHN, A. W., and LENEL, P. O. Über die Reaktionsprodukte einer schonenden partiellen Holzhydrolyse. **[The reaction products of a mild partial hydrolysis of wood.]** *Papier, Darmstadt* 3 (7/8), 1949 (109–18). 45 refs. [G.g.] L.S.

2124. HARRIS, E. E., and KLINE, A. A. **Hydrolysis of wood cellulose with hydrochloric acid and sulphur dioxide and the decomposition of its hydrolitic products.** *J. phys. colloid Chem.* 53 (3), 1949 (344–51). 8 refs. D.S.I.R.

The rates of hydrolysis of Douglas-Fir cellulose in dilute HCl and in aqueous SO_2 were determined. These rates were compared with those in sulphuric and phosphoric acids, previously determined. On a molar basis, HCl hydrolyses cellulose at about the same rate as H_2SO_4 while SO_2 gives about $\frac{1}{7}$ the rate of H_2SO_4. The net yield of reducing sugar was not so high with SO_2 as with HCl or H_2SO_4. *From authors' summary.*

2125. **Wood hydrolysis.** *Rep. For. Prod. Aust. 1948–9*, 1949 (15–6).

[Cf. *For. Abstr* 10 (No. 1878).] The wood and holocellulose of *Eucalyptus regnans* were hydrolysed for varying times at 92° C. with normal H_2SO_4. For removal of the first 11% of pentosan the molar ratios of pentosan to uronic acid were 6·3 for holocellulose and 11·2 for wood. Further experiments on the hydrolysis of *E. regnans* wood at 150°, 160° and 170° with 2% H_2SO_4 were carried out using a percolating apparatus. After hydrolysis for periods dependent on the temperature, practically no hydrolysis proceeds although the residue contains cellulose. The amount of the residue was 30% at 150°, 22% at 160° and 18% at 170°. The last residue contained about 40% cellulose. Sugars prepared by hydrolysis of *E. regnans* were separated by paper partition chromatography. Only glucose and xylose could be separated, although other sugars were known to be present in small amounts.

2126. **Wood-sugar molasses stock-feeding tests continued to produce good results.** *Rep. Nth. Rocky Mt. For. Range Exp. Sta. 1948*, 1949 (16–7).

Results of comparable feeding tests conducted at the Montana State College Agricultural Experiment Station on 4 lots of 17 lambs each, showed no significant difference in gains of lambs fed on wood-sugar molasses and on cane molasses. Results on dairy cattle under study at Wyoming State College Agricultural Experiment Station further confirmed the fact that the addition of 5% wood-sugar molasses did not affect the palatability of the grain ration and the stock showed no preference for similar concentration of cane molasses; nor did 5% wood sugar affect the flavour of the milk.

2127. SUNDMAN, J. Aldehydbildning och alkoholutbyte vid förjäsning av sulfitavlut. **[The formation of aldehyde and the yield of alcohol from fermentation of sulphite waste liquor.]** *Papp. Trävarutidskr. Finl.* 31 (17), 1949 (309). [Sw.e.] [Centrallaboratorium Ab., Helsinki.] P.R.

2128. ROSENQVIST, E. O. (to Svenska Jästfabriks Aktiebolaget). **Process for the production of yeast [in a nutrient mixture of molasses wort and still residues from fermented sulphite waste liquor].** *U.S. Patent* No. 2,460,947, Feb. 8, 1949. *Abstr.* in *Paper Tr. J.* 129 (5), 1949 (29). P.R.

2129. **Extractives of wood.** *Rep. For. Prod. Aust. 1948–9*, 1949 (16–7).

An unexplored source of tannin is the kino in Jarrah (*Eucalyptus marginata*). This substance contains mainly tannin and exists as accretions in the cells to the extent of 25–30% of the timber. It may be possible to extract it from Jarrah waste. A fractionation process has been developed enabling the kino of *E. calophylla* to be separated into a colourless crystalline compound (5%), a blood-red pigment (20%) and a brown tannin. *E. corymbosa* kino also contains the colourless compound. An investigation on the colouring materials in *E. regnans* is in progress. [Cf. *For. Abstr.* 11 (No. 2188).]

33.4. *Converted Structural Timber*

See also *For. Abstr.* 11 (Nos. 1854–5, 1866, 1868, 1979–80, 2150, 2212 *et seq.*).

2130. AGOSTINI, R. Sulla determinazione del volume delle travi a spigoli smussati. **[Determining the volume of bay-quoin beams.]** *Ital. for. mont.* 4 (4), 1949 (213–9). 2 refs. [It.]

2131. **Double-hung sash and case windows (Scottish type).** *Brit. Stand.* No. 664, Pt. 3, 1949. pp. 15. Price 2*s.* 6*d.* P.R.

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

See also *For. Abstr.* 11 (Nos. 1813, 2094–2100).

2132. **Pitprops: European consumption and trade.** *Unasylva* 3 (5), 1949 (183–5).

2133. **Specifications and dimensions for Southern Pine poles.** *Standard, American Standards Association, New York* No. 05.4–1941, 1945. pp. 10. Price 20*c*. P.R.

2134. **Transmission poles.** *Rep. For. Dep. Uganda 1948*, 1949 (22–3).

To ascertain whether locally grown *Eucalyptus saligna* poles are comparable to those grown in S. Africa, samples were sent by air to the Forest Products Institute, Pretoria. From the results of the strength and preservative tests, it seems probable that this species is suitable for transmission poles of suitable design. There is always a considerable range in the strength and weight of *E. saligna* timber. Average strength is likely to be as follows:—modulus of rupture 10,780 lb./sq. in.; maximum crushing strength 6,335 lb./sq. in.; hardness, (end) 948 lb., (side) 608 lb.; shear 1,021 lb./sq. in. *E. saligna* readily absorbs creosote into the sapwood. A mixture of creosote and diesel oil is preferable to creosote alone. No pole with less than ½ in. of sapwood should be treated. Poles more than 40 ft. long are likely to have too little sapwood for impregnation. Poles should be barked immediately they are felled, and banded top and bottom to prevent splitting. Moisture content before treatment should not exceed 25%. About 5 weeks of drying are required for every inch of diameter, poles should be put directly in the ground; cementing the butt retards circulation of air and accelerates rot.

33.6. *Packing Boxes, Crates, etc.*

2135. SARDO, W. H. **What's new in wooden boxes and wooden pallets.** *Circular, Engineering Experiment Station, University of Illinois* No. 56, 1949 (203–9). P.R.

A paper presented at the First Short Course on Industrial Packaging and Materials Handling, Chicago, October 1948, discussing the principles of design and nailing of wooden packages, methods of preserving the wood against rot and insect attack, and the use of water-repellents, and new fasteners.

2136. WOLSDORF, H. A. **Wirebound boxes for export.** *Circular, Engineering Experiment Station, University of Illinois* No. 56, 1949 (190–202). P.R.

A paper presented at the First Short Course on Industrial Packaging and Materials Handling, Chicago, October 1948, describing with illustrations the design of wooden boxes used for the export of heavy goods, such as machinery.

2137. SALONE, J. Les emballages en bois. **[The use of wood for packaging.]** *Emballages, Paris* 19 (111; 112), 1949 (17–20; 23–6). [F.] L.S.

Discusses species used, and standard designs in France, U.S.A. and Europe.

2138. ***Pinus radiata* for butter boxes.** *Rep. Wds. For. Dep. S. Aust. 1946–7*, 1948 (10).

A series of tests was made to determine the suitability of *P. radiata* wood for the manufacture of butter boxes. Indications to date are that, provided that knotty and heavily resin-laden stock be rejected, the kiln-drying of case slats at their final thickness and at sufficiently high temperatures (200° F. or higher) will render *P. radiata* sufficiently taint-free for use in containers for butter, eggs, etc. The report also indicates that the prospects of eliminating taint by a solvent-seasoning process seemed particularly good. The ⅜-in. 'solid' butter boxes used in the local S. Australian trade, although only air dried, gave better results, as regards taint, than standard export boxes made of Queensland timbers. It is suggested that this may have been due to the fact that the local boxes had been attacked by blue-stain fungus, which in some way affected the extractives ordinarily responsible for tainting.

33.7. *Firewood*

2139. GAUGER, A. W., and DARBY, H. T. **[Analysis methods for] solid and gaseous fuels.** *Analyt. Chem.* 21 (2), 1949 (227–40). 212 refs. P.R.

Includes wood, charcoal, wood tar.

33.8. *Other Manufactured Products*

See also *For. Abstr.* 11 (Nos. 1968–9, 2101).

2140. COOMBES, L. P. **Aeronautical research in Australia.** *Aircr. Engng.* 31 (243), 1949 (140–3, 152). 11 refs. P.R.

Includes reviews of research on the use of Australian timbers in aircraft and the effect of tropical conditions on wooden aircraft.

2141. MUELLER. **Wood and plastics in place of light metals in air-frame construction. 2nd interim report.** *Transl. Minist. Supply* No. GDC 16/429 B (*a*) T. [*n.d.*] pp. 11 + 2 photos, 4 dgms., 7 gphs. Transl. from *Focke-Wulf Report* 8.3.1943. P.R.

2142. KOLLMAN *et al.* **Wood in aircraft construction.** *Transl. Minist. Supply* No. GDC 10/6102 T. [*n.d.*] pp. 84 + 122 photos, dgms., gphs., 4 tbls., 58 refs. Transl. by C. M. Davies from *Lilienthal-Gesellschaft Report* No. 157, 1942. P.R.

2143. IABLOKOFF, A. K. Les contreplaqués dans la construction aéronautique. **[Plywood in aircraft construction.]** *Recherche Aéronautique, Paris* 1949 (8), (13–7). 4 refs. [F.f.] [Office National d'Études et de Recherches Aéronautiques, Paris.] L.S.

The use of plywood in aircraft is discussed and its disadvantages are enumerated. Suggested improvements are: (1) the use of sliced instead of peeled wood, giving a better distribution of strength properties; (2) research on the best fibre angle for successive plies and on optimum thickness and number of plies; (3) the use of better quality—coniferous rather than deciduous—woods; (4) the use of plywood made water-resistant by impregnation with synthetic resins; and (5) the use of improved woods.

2144. FOUCHARDIÈRE, DE LA. Le bois dans la construction des bateaux. **[Wood in the construction of boats.]** *Rev. Bois Appl.* 4 (6), 1949 (23–7). [F.]

Describes the construction of wooden pleasure boats and yachts and discusses some of the woods used.

2145. HOLT, R. **The 'Tees Commissioner'.** *Wood* 14 (8), 1949 (228–33).

Techniques and materials used in building a special craft for the Tees Conservancy Commission, with a list of timbers and notes on where they are used.

2146. WOODS, R. P. **Ships decking.** *Quart. Rev. Timb. Developm. Ass.* 2 (7), 1949 (15–6). P.R.

Various timbers have been tested as substitutes for Teak in ships' decking. Essential properties are durability, even wearing, and rapid bleaching. White Peroba (*Paratecoma peroba*) has given good results in service. Preliminary investigations on Agba (*Gossweilerodendron balsamiferum*) and Ayan (*Distemonanthus benthamianus*) indicate that Agba will give better results. Kokrodua (*Afrormosia* sp.) from the Gold Coast resembles Teak very closely in all its properties but it is not certain whether it will bleach sufficiently for use on promenade decks. Marai (*Podocarpus spicatus*) suffers from severe discoloration as a result of unusually high water retention.

2147. LEFKOF, E. A. **Some specialized uses of Hard Maple [*Acer saccharum*].** *Pa. For. Wat.* 1 (6), 1949 (142–3).

An account of the way in which logs are converted into ten-pin, shoe-last, and shoe-stretcher billets. The ten-pins must be of sapwood only, so that heart rot is not an impediment.

2148. PAUL, B. H. **Comparisons of species of wood for gunstocks.** *Rep. U.S. For. Prod. Lab., Madison* No. *D*1723, 1945. pp. 4 + 1 gph., 2 tbls. P.R.

Experiments showed that Black Cherry (*Prunus serotina*), Red Maple (*Acer rubrum*), Yellow Poplar (*Liriodendron tulipifera*), Sugar Maple (*Acer saccharum*) and Yellow Birch (*Betula lutea*) were suitable substitutes for Black Walnut for the manufacture of gunstocks.

33.9. *Grading [including Standard Specifications] and Storage of Converted Timber*

See also *For. Abstr.* 11 (Nos. 2131, 2133, 2212).

2149. Cherestea de rășinoase—clasificare după calitate. **[A proposed standard for coniferous timber by quality classes.]** *Buletinul de Standardizare, București* 1 (5), 1949 (78–89). [Rum.] P.R.

2150. **Supplement No. 2 to U.S. Department of Agriculture Miscellaneous Publication 185, 'Guide to the grading of structural timbers and the determination of working stresses'. Recommendations for basic stresses.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1715, 1948. pp. 11 + 1 gph., 1 tbl. P.R.

Presents in tabular form revised recommendations for basic stresses of structural timber, with the principles on which they are

based and information on their application for different purposes.

2151. DESCH, H. E. **Proposed new grading rules for Empire hardwoods.** *Aust. Timb. J.* 15 (5), 1949 (330, 332, 334, 337).

Outlines and discusses a set of proposed rules drawn up by the Malaya Forest Department. The draft rules follow those of the National Hardwood Lumber Association more closely than the present Empire rules. [Cf. *For. Abstr.* 10 (No. 1371).]

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

See also *For. Abstr.* 11 (No. 1701).

2152. BRIGGS, L. H. **Plant products of New Zealand.** *Journal and Proceedings, Royal Society of New South Wales, Sydney* 80, 1947 (151–77). 193 refs. P.R.

Notes on the chemistry of essential oils, resins, acids, resinols, alkaloids, colouring matters, tannins and saponins occurring in New Zealand plants, including trees.

34.21. Fodder Grass and Grazing. Forest Litter

2153. JOHNSON, W. M., and HULL, A. C., JR. **Range forage species for seeding in Ponderosa Pine.** *Res. Notes Rocky Mt. For. Range Exp. Sta.* No. 5, 1949. pp. 3.

34.24. Tanning Materials. Cork. Bark products

See also *For. Abstr.* 11 (Nos. 1656, 1661, 1684, 1714, 2030).

2154. DESTEXHE, Y. Contribution à l'étude du dosage de la matière tannique dans les végétaux. **[Determination of tannins in plants.]** *Mémoire, Lejeunia, Liége* No. 5, 1944. pp. 85. 90 refs. [F.] P.R.

Describes and discusses methods of isolating tannins and of determining the quantity present.

2155. HARWOOD, V. D., and PURVES, C. B. **Bark research at McGill University.** *Paper Tr. J.* 128 (22), 1949 (19–23). 26 refs. P.R.

The results of extraction of White Spruce bark by methanol followed by hot water and NaOH are tabulated.

2156. KÜNTZEL, A., and MELZER, E. **The fractionation of Pine bark extract with ethanol.** *Journal of the American Leather Trades Association, Easton, Pa.* 43 (10), 1948 (613–33). 15 refs. Transl. by H. B. Merrill from *Collegium, Haltingen* No. 879, 1944/5 (1–23). [Institute of Leather Tanning Chemistry, Darmstadt.] L.S.

Fractions of Pine bark extract, insoluble in 85% alcohol, insoluble in absolute alcohol, and soluble in absolute alcohol respectively, were analytically examined and their tanning properties determined. Results are tabulated. Sulphate extraction increases the tannin yield but causes deterioration in the quality of the tannin obtained.

2157. CH'IN, T.-H., and WANG, Y.-N. **The vegetable tannin-materials in Taiwan.** *Mem. Taiwan Forest Res. Inst.* No. 1, 1947 (22–31). *Chem. Abstr.* 42 (21), 1948 (8505). P.R.

The tannin fractions are given for bark of 13 species.

2158. **Wattle Research Institute Report for 1948.** University of Natal, Pietermaritzburg, S. Africa. 1949. pp. 26.

The first annual report of this institute, which is run jointly by the S.A. Wattle Growers' Union, the University of Natal, and the Union Dept. of Forestry, consists largely of a programme of research.

2159. BAILEY, F. M. **Forest management and tannin-production in N.S.W.** In *Symposium on the Native Tanning Materials of Australia* [*Sydney*], 1946 (5–6). [Organized and convened by the Australian Section of the International Society of Leather Trades Chemists.] B.L.M.R.A.

Black Wattle (*Acacia mollissima*) from strains giving high, medium and low yields of tannin, was planted on different sites during 1942–3. It is too early yet for positive results. Information collected will include data on comparative rates of growth and tannin production of different strains, the determination of economic rotations on different sites, effect of soil type and site on tannin yields, and environmental agencies affecting growth and their control. Similar experiments are planned

for *A. penninervis*, *A. decurrens* and *A. irrorata*. The collection of bark of White Cypress Pine (*Callitris glauca*), a species found over large forest areas and supporting an extensive sawmilling industry, might be more economically carried out at the mill, but if effected in the forest would probably yield more bark from stumps and crowns, in both final fellings and thinnings. Black Cypress Pine (*C. calcarata*) is of more limited occurrence and in general is too scattered to support a sawmilling industry. Similar methods might, however, be adopted where it occurs in quantity. The prospects of large-scale exploitation for tannin of Eucalypts are unpromising, because of the mixed nature of the stands, and the variability of tannin yields from different species. Exploitations of pure stands of *E. rostrata* in the Murray River area might be practicable. The possible introduction of exotic species (Mallet—*Eucalyptus astringens*, Quebracho—*Schinopsis* spp., and Sumach—*Rhus coriaria*) is considered.

2160. Choudary, K. S., and Nayudamma, Y. **Studies on Konnan bark. 1.** *Journal, Society of Leather Trades' Chemists, Croydon* 32 (6), 1948 (211–3). 2 refs. [Institute of Leather Technology, Madras.] L.S.

Tabulated results giving the tannin contents of 9 South Indian tanning materials: the bark of Konnan (*Cassia fistula*) has a content of 11·2% as against 9·6 for *Acacia arabica* at the lower and 35·8 for *Acacia decurrens* at the upper end of the scale. Other tables show the results of analysis, cold leaching, and extraction at different temperatures of the bark.

34.25. Decorative Branches. Medicinal and Edible Plants

See also *For. Abstr.* 11 (Nos. 1693, 1731).

2161. Lazara, M. P. **Holly [*Ilex aquifolium*] as a crop in the State of Washington.** *For. Cl. Quart.* 22 (3), 1948–9 (13–7).

2162. Quisumbing, E. **Vegetable poisons of the Philippines.** *Philipp. J. For.* 5 (2/4), 1949 (145–71). 51 refs.

Includes tabulated data on plants: (1) poisonous to man, (2) used as arrow poison, (3) used as fish poison, and (4) poisonous to (domestic) animals.

2163. Labriola, R. A., Berinzaghi, B., and Deulofeu, V. Estructura parcial de los alcaloides liberados de las especies de *Erythrina*. **[Partial structure of the 'liberated' alkaloids of *Erythrina* species.]** *Cienc. e Invest., B. Aires* 5 (8), 1949 (349). [Span.] [Facultad de Ciencias Exactas, Físicas y Naturales, Buenos Aires.] A.P.B.

2164. **[Chemical constituents of *Mitragyna* spp.]** *Rep. colon. Res. Comm., Lond. 1948–9*, 1949 (49).

The bark of *Mitragyna inermis* contains the alkaloid rhynchophylline, but in relatively small amount. A triterpene acid (quinovic acid) has also been isolated. *M. rubrostipulacea* is an excellent source of mitraphylline, both bark and leaves containing about 5 g./kg. *M. ciliata* leaves yielded 2 g./kg. of rotundifoline.

2165. Paris, M. R., and Moyse-Mignon, H. Étude préliminaire du *Fagara viridis* A. Chev. et du *Fagara parvifolia* A. Chev. **[Preliminary study of *F. viridis* and *F. parvifolia*.]** *Annales pharmaceutiques françaises, Paris* 6 (9/10), 1948 (409–21). 10 refs. [F.] L.S.

Cf. *For. Abstr.* 10 (No. 2163).

34.26. Resin. Turpentine. Oils. Gums. Latex. Dye-stuffs, etc.

See also *For. Abstr.* 11 (Nos. 1697, 2129, 2196–7).

2166. Lundquist, E. Onderzoekingen betreffende een nieuwe tapmethode voor copal. **[Experiments with a new method of tapping for copal.]** *Tectona* 38 (4), 1948 (197–204). [Du.e.]

The disadvantages of the usual method of tapping *Agathis* spp. for copal gum are that:—the flow ceases in 3–14 days, while the trees can be visited, at most, once a month; the gum is usually dirtied with pieces of bark, earth etc.; a large piece of bark must be removed at each freshening, and after about 2 years a high scaffolding is necessary to reach the face; owing to the large faces, decay is inevitable. Large blocks of fossil copal are sometimes found in the soil, and these are supposed to have been formed as a result of wounds in the roots of *Agathis* trees. The author reasoned that these large blocks of the copal had been formed

because the wounds, being in darkness, had been able to flow for a long time. Accordingly he experimented with 3 trees, cutting through the cambium a V-shaped channel, 1½ cm. wide, ⅓ of the way round the stem. These wounds were covered with strips of tin plate. Gum flowed for 3–6 months, and when it ceased, and the tin plate was removed, it was found that the wound had healed. In a second trial, half the trees had been tapped by the old method and produced very little gum; some were protected with tin plate and some with cloth dipped in boiling copal; the cambium was not cut. These wounds kept flowing for 2–4 months and when the coverings were removed they were found to be all healed. Only a narrow edge of bark had died under the cloth, but a wide strip under the tin plate. It was easy to freshen the wounds and the flow became as abundant as before. Tests are now being made, covering the wounds with thick cloth secured by nails. Provisionally it seems advisable, not to cut the cambium, to cover the wound with thick cloth, and to renew the cut after a lapse of 2 months. *From author's summary.*

2167. SZERBAKOW, K. **Development of resining in Poland and improving methods of collecting Pine and Spruce resin from standing trees.** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (24–6).

A summary account of the development of resin tapping in Poland, its vicissitudes through 2 World Wars and the final evolution, following the researches of Jezierski (1935) and others, of a flourishing and well organized industry. Up to 1947 Pine only was tapped, but in that year trial tappings started on Spruce, which has to date yielded well.

2168. AGUADO SMOLINSKI, J. La extracción de la miera. **[Resin tapping.]** *Cartilla Rural del Servicio de Capitación y Propaganda, Ministerio de Agricultura, Madrid* No. 3, 1949. pp. 50 + 7 photos + 1 map + 1 dgm. [Span.] Price 5 *ptas.*

An illustrated popular handbook on the Spanish resin industry containing (1) introductory notes on the industry in Spain and elsewhere, (2) a description of the two species tapped in Spain, and (3) an account of the tapping methods used.

2169. SNOW, A. G., and LANIER, H. R. (to Sec. Agric., U.S.A.). **Bark chipping hack for turpentining trees.** *U.S. Patent* No. 2,434,869, Jan. 20, 1948. *Biol. Abstr.* 22 (7), 1948 (1702).

Description of a specially designed hack head for completely removing bark but not wood, particularly for use on trees where chemical stimulation of the flow is practised.

2170. MOORE, W. H. **Results from using sulphuric acid to prolong gum flow.** *Naval Stores Rev.* 59 (22), 1949 (12, 18–9).

Some practical conclusions reached by the Southern Resin and Chemical Co., Glen Saint Mary, Fla., on sulphuric-acid stimulation, after using the method on a commercial scale since 1945. Acid stimulation was found very adaptable to low-yielding Longleaf Pine [*Pinus palustris*], 20 acid streaks producing about the same total yield as 32 regular non-acid streaks. It is particularly useful in stands requiring thinning, where trees to be eliminated can be selected for tapping 3 or 4 years before they are felled, the larger trees remaining for future tapping. Freshening twice every 3 weeks was found preferable to once every 2 weeks, the face being extended by only ½ in. each time.

2171. OUDIN, A. Activation chimique de la production résineuse. **[Chemical stimulation of resin yield.]** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (19–20). [F.]

A series of experiments are in progress on *Pinus pinaster*, treating both French and herringbone types of face with 30, 40 and 50% solutions of H_2SO_4. In one set, each tree has an untreated face on the opposite side as control. Results to date indicate that the increase in yield produced by chemical stimulation is much less than that reported from America for Southern Pines. Callus formation is also poorer.

2172. PHILIPPIS, A. DE. Les effets du gemmage sur *Pinus pinea* L. et sur *P. pinaster* Sol. **[The effects of resin tapping on *Pinus pinea* and *P. pinaster*.]** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (21–3). [F.]

Two years' results are given for *P. pinea*, mature and young trees, with French and with herringbone faces, tapped continuously and tapped to death, and for *P. pinaster* (young trees) continuously tapped with a French face. Individual variation in yield was very marked. No significant difference was observed in

production, weight, size, or germination, of seed from tapped and untapped trees. The effect of tapping on diameter increment was negligible in mature trees with narrow annual rings, but in young trees the width of annual ring was reduced to ½ or ⅓ during the tapping period. It was observed that an infestation of *Blastophagus piniperda* in a mature stand of *P. pinea* in Tuscany was almost confined to trees tapped to death. Comparison of the figures shows the absolute necessity of making tests on several different experimental plots and over a period of several years.

2173. GIORDANO, G. Contribution à l'étude des caractéristiques du bois des pins soumis au gemmage. **[Properties of wood from tapped Pines.]** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (15–6). [F.]

Gives comparative density, axial compression, bending strength, nail-holding capacity, and impact strength for tapped and untapped wood respectively, for *Pinus pinea*, *P. pinaster* and *P. nigra* vars. *austriaca* and *calabrica*. In general it was found that tapping resulted in an increase in density and a diminution of mechanical strength.

2174. CRIVELLARI, D. Expériences sur les effets du gemmage sur *Pinus halepensis* Mill. et sur *Pinus nigra* Arnold. **[Experiments on the effects of resin tapping on *P. halepensis* and *P. nigra*.]** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (13–4). [F.]

Summarizes results of 2 years' investigations carried out jointly by the Italian Forest Service and the Forestry Institute at Florence. The yield obtained from *Pinus halepensis* with continuous tapping was 7·4 and 4·2 times that from *P. nigra* var. *calabrica* and *P. nigra* var. *austriaca* respectively; the corresponding figures for tapping to death were 4·8 and 4. The French method seems most suitable for tapping *P. halepensis*, and the herringbone method for both varieties of *P. nigra*. Yield varied greatly with size of tree; *P. halepensis* of 61–70 cm. girth yielded 4 kg., and those of 181–190 cm. girth 19 kg. There was also great variation in yield between individuals. Investigations into possible effects of tapping on production, size, weight, and germination, of seed gave negative results. *Pinus halepensis* at Foggia, tapped continuously by the French method for 4–5 years, showed 4·04% decrease in increment % for the young tree (36 years) and 1·63% for a mature tree (69 years). *P. halepensis* on the Ionian Sea coast, tapped by the French method for 2 years, showed a 0·78% decrease in increment % when tapped continuously and 1·78% when tapped to death.

2175. MESSERI, A. **Anatomical alterations in the wood of Aleppo Pine after resin-tapping.** *Abstr.* in *Bull. World For. Congr.* No. 8, 1949 (17–8).

This study was made, over a single tapping season, to determine the effect of different methods of tapping on wood formation. It was found that in wood formed during tapping of *Pinus halepensis* by the French method (with an axe) the resin ducts were unusually large and numerous, but the rhythm of cambial activity was the same as in the controls. When the herringbone method (with a scraper) was used, there was an acceleration of cambial activity, resulting in the formation of several growth rings during one tapping season, but the resin ducts were small and irregular.

2176. MITTA, A. E. A., and ALVAREZ, I. Mieras argentinas. **[Argentine resins.]** [*Publication of*] *Instituto Tecnológico, Dirección General de Industria Manufacturera, Buenos Aires* (*Series A*) No. 1, 1949 (3–12). 3 refs. [Span.] P.R.

A general account of the chemical composition of resins, with a particular study of resin from Pine [*Pinus pinaster?*] growing in Buenos Aires province.

2177. DUPONT, G., DULOU, R., and NAFFA, P. Les constituents sesquiterpéniques de l'essence de térébenthine de pin maritime. **[The sesquiterpene constituents of turpentine from Maritime Pine: caryophyllene and longifolene.]** *Bulletin de la Société Chimique de France, Paris* 15 (9/10), 1948 (990–4). 10 refs. [F.] O.R.S.

2178. IVANOFF, D., and IVANOFF, C. Analyse de l'essence de térébenthine bulgare du *Pinus silvestris*. **[Analysis of Bulgarian spirit of turpentine from *P. sylvestris*.]** *C.R. Acad. bulg. Sci.* (*Sci. math. nat.*) 2 (1), 1949 (41–4). 6 refs. [F.] D.S.I.R.

2179. GUENTHER, E., and LANGENAU, E. E. **Essential oils and related products [: analytical developments].** *Analyt. Chem.* 21 (2), 1949 (202–7). 115 refs. P.R.

2180. NIGAM, S. S., and DUTT, S. **Chemical examination of the essential oil derived from the oleoresin of *Shorea robusta*.** *Indian Soap Journal, Calcutta* 12, 1946 (77–86). *Chem. Abstr.* 42 (10), 1948 (3536). P.R.

2181. MACHADO, R. D., and SOUZA, A. H. DE. Esclarecimentos e sugestões sôbre o óleo essencial de sassafrás. **[Explanatory notes and suggestions about the essential oil of Sassafras.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (206–14). 27 refs. [Port.] P.R.

Short notes on various species producing 'sassafras' oil, with a study of the properties of American and Brazilian 'sassafras' oils and a discussion of the position of the Brazilian product in the North American market.

2182. ARAUJO, P. A. DE MATOS. O óleo essencial de sassafrás no Estado de Santa Catarina. **[The essential oil of 'Sassafras' in the state of Santa Catarina.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (260–70). 6 refs. [Port.] P.R.

Ocotea pretiosa is thought to be the source of most of the 'sassafras' oil produced in Santa Catarina. A short botanical account of the tree is given, with notes on wood anatomy, on the apparatus and methods used in oil extraction and on the industry in Santa Catarina.

2183. A essência de Inamui. **[Inamui essence.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (200–1). [Port.] P.R.

A chemical study of the liquid found in trunk cavities of *Nectandra elaiophora*.

2184. PENFOLD, A. R., MORRISON, F. R., and MCKERN, H. H. G. **Studies in the physiological forms of the Myrtaceae. Part I: *Leptospermum citratum* Challinor, Cheel and Penfold and its physiological forms. Part II: The occurrence of physiological forms in *Melaleuca alternifolia* Cheel.** *Researches on Essential Oils of the Australian Flora, Museum of Technology and Applied Science, Sydney* 1, 1948 (12–9). 15 refs. L.S.

(I) Distinct physiological forms of *L. citratum*, which are morphologically indistinguishable, are based on oil groups: (1) the lemon-scented oil from the type or original form, consisting principally of citral and citronella and of considerable economic value; (2) the terpenic oil of variety A, of no great economic value; and (3) the oil of variety B, with a rose-like smell, containing citral as a minor component (10–20%) and the alcohols geraniol and citronellol and their esters, which produce the rose-like smell. This oil is of great perfumery value. Seed was procured in 1941 from typical trees of all 3 forms, the seedlings were raised under nursery conditions and planted out, and after 4 yrs. the trees were cut, the whole foliage was steam-distilled and the oils were examined. Results are tabulated. Progeny of the *L. citratum* 'type' and variety A yielded oils identical with those from the parent forms; those from variety B, however, showed great variation in their oils, which fell roughly into 2 groups, one displaying aldehyde inheritance (as those of the 'type' form) and the other predominantly hydrocarbon inheritance (form A). Only a few individuals (3–5%) yielded oils conforming to the original form B descriptions.

(II) Foliage samples were taken from a random selection of 49 trees of *M. alternifolia* growing naturally and distributed over a wide area along the north coast of New South Wales. The samples were steam-distilled and the oils examined for optical rotation and cineole content. Results are tabulated. The variation in cineole content is too wide to be due to seasonal fluctuation; nor can it be due to environment, since many of the trees were growing together in similar conditions. It therefore appears that distinct physiological forms of *M. alternifolia* exist and that trees can be divided into 3 groups classified by low, medium and high cineole content. An excellent correlation is obtained between optical rotation and cineole content, suggesting that the former provides a method, less tedious than that of quantitative determination, for estimating the cineole content.

2185. PENFOLD, A. R., MORRISON, F. R., and MCKERN, H. H. G. **Studies in the Myrtaceae and their essential oils. Part I: The seasonal variations in yield and cineole content of *Melaleuca alternifolia* Cheel. Part II: Some sources of error in the study of plant populations: *Eucalyptus citriodora* Hook.** *Researches on Essential Oils of the Australian Flora, Museum of Technology and Applied Science, Sydney* 1, 1948 (5–11). 11 refs. L.S.

(I) Samples of foliage were collected from 5 trees of *Melaleuca alternifolia* growing on the north coast of N.S.W. at monthly intervals over a period of 11 months, and distilled. The results, which are tabulated, show: (1) that the oil yield is lower in winter than in summer, a sudden increase appearing in November, the first month of summer, the yield falling off again in June, the first winter month; (2) that the cineole content of the oil appears to increase during the winter months, and (3) that each tree appears to behave individually both as regards oil yield and cineole content.

(II) Experiments were made to find the effects of the age of leaves, of storing, and of sampling methods, on oil yields. The results, which are tabulated, show:—(1) That the yield of oil and the citronella content reach a maximum in the young mature leaf and are significantly greater in the aged than in the very immature leaf. The difference in oil content between the aged and young mature leaf may be only apparent, the absolute quantity of oil remaining constant while the total weight of the leaf increases. (2) That, although Eucalyptus leaf generally shows reasonable keeping qualities, the maximum storage period for each species should be determined. That for *E. citriodora* is shown to be about 14 days. (3) That figures for oil yield for any one tree will vary considerably unless a large number of small pieces of foliage scattered randomly over the tree are taken and thoroughly mixed.

2186. WATSON, E. M., and GARDNER, C. A. **The essential oils of the Western Australian Eucalypts. Part VIII. The oils of *Eucalyptus campaspe* S. Moore and *E. kochii* Maiden et Blakely.** *Journal of the Royal Society of Western Australia (Inc.), Perth* 31 (1944–5), 1948 (33–5). 3 refs. H.S.B.

2187. RALPH, C. **Some minor constituents of *Eucalyptus* oils—[*E. dives* and *E. australiana*]. Part I.** *Journal and Proceedings of the Royal Society of New South Wales, Sydney* 80 (4), (1946) 1947, (208–11). 3 refs. O.R.S.

2188. HILLIS, W. E. **Eucalyptus kinos [: their chemical properties and uses].** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 174, 1949 (2–3).
Cf. *For. Abstr.* 11 (No. 2129).

2189. TIOMNO, F. R. **The gum of the Cashew tree. Chemical and technological study.** *Revista de química industrial, Rio de Janeiro* 15 (168; 172), 1946 (23–6; 19–24). *Chem. Abstr.* 41, 1947 (2921–2). O.R.S.

2190. **[The gum-resin of *Commiphora* (*Balsamodendron*) *mukul*.]** *For. Res. India Burma 1946–7*, [1949?] (70–1).
Cf. *For. Abstr.* 5 (131).

2191. HIRST, E. L., and JONES, J. K. N. **The galactomannan of Carob-seed [*Ceratonia siliqua*] gum (Gum gatto).** *Journal of the Chemical Society, London* Aug., 1948 (1278–82). O.R.S.

2192. CUNNEEN, J. I., and SMITH, F. **The constitution of Mesquite gum Part I. Isolation of 6- and 4-glucuronosidogalactose. Part II. Methylated Mesquite gum.** *Journal of the Chemical Society, London* Aug., 1948 (1141–57). O.R.S.

2193. **[Gum of *Sterculia setigera*.]** *Rep. colon. Res. Comm., Lond. 1948–9*, 1949 (50).
The gum of *S. setigera* has been found to resemble gum tragacanth and gum karaya. It is a partially acetylated polysaccharide, and on hydrolysis it gives rise to the sugars *l*-rhamnose, *d*-galactose, *d*-galacturonic acid and *d*-tagatose.

2194. MCMULLEN, A. I. **Extraction of latex of *Hevea brasiliensis* under sterile conditions.** *Nature, Lond.* 164 (4173), 1949 (715–6).
The apparatus described (and illustrated) in this note was developed during an investigation in Malaya with the object of obtaining samples of rubber latex from the living tree under completely aseptic conditions and in the absence of oxygen. It is thought that it might prove useful for latex research in *Hevea* and other laticiferous plants.

34.27. Seeds. Fruits. Leaf Fodder. Fibres and Flosses

See also *For. Abstr.* 11 (Nos. 1660, 1697, 2191).

2195. WATERER, R. R. **Wild fruit trees.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (10–1).

The forests contain many wild Olive, Carob and Hawthorn trees, and in some forests these species form an important part of the crop. They are, however, a source of trouble, since it is the custom to graft such trees surreptitiously and afterwards claim ownership of them. In the past this was done extensively, and thousands of privately owned, or claimed, fruit trees are now found in the forests, occupying the best sites; forest trees growing near enough to shade them are ringed by the owners or claimants. These species are now excluded from the forests as far as possible, and the public are encouraged to uproot wild Olives for grafting stock and also to uproot and remove the grafted fruit trees from the forest and transplant them to their own properties. The total recorded number of grafting stocks removed from the forest in 1947 was 57,789 and in 1948, 43,192.

2196. BATHIE, H. P. DE LA. Les muscadiers (*Brochoneura*) de Madagascar. **[The nutmeg trees (*Brochoneura*) of Madagascar.]** *Rev. int. Bot. appl. Agric. trop.* 29 (321/2), 1949 (407–12). [F.] P.R.

Gives botanical descriptions of the 5 *Brochoneura* species which grow wild in Madagascar, and discusses the uses of the oils obtained from their fruits.

2197. CHEVALIER, A. Quelques arbres fruitiers et oléagineux peu connus de l'Afrique tropicale: canaris et safous. **[Some little-known fruit- and oil-producing trees of tropical Africa: *Canarium* and *Pachylobus* spp.]** *Rev. int. Bot. appl. Agric. trop.* 29 (321/2), 1949 (385–95). 3 refs. [F.] P.R.

Gives botanical notes, notes on the natural distribution and recommendations for cultivation.

2198. GRASSO, V. La mummificazione delle castagne giapponesi. **[The shrivelling up of Japanese chestnuts.]** *Nuovo G. bot. ital.* (*n.s.*) 55 (4), 1948 (584–6). 4 refs. [It.] O.B.D.

Fruit of *Castanea crenata* was found to shrivel up and grow mouldy, after a short period of storage. The causal organism is believed to be *Phomopsis viterbensis*.

2199. O miriti ou buriti, fonte de caroteno. **[*Mauritia flexuosa*, a source of carotene.]** *An. bras. Econ. flor., Inst. nac. Pinho* 1 (1), 1948 (130–1). [Port.] P.R.

A chemical analysis of the fruit pulp.

2200. PENDLETON, R. L. **Importance of shrubs for livestock feeding in humid tropical regions.** *Bull. agric. Congo belge* 40 (2), 1949 (1907–9). 3 refs. [E.]

A short account of the use as fodder of *Leucaena glauca* and *Sesbania grandiflora* in various tropical regions.

34.28. Broom. Canes and Bamboos

See *For. Abstr.* 11
(Nos. 1720, 1908, 2047).

35. SALE AND DISPOSAL OF FOREST PRODUCTS. TIMBER TRADE

See also *For. Abstr.* 11
(Nos. 1580–1, 1970, 2032, 2034, 2132, 2412).

2201. **Forest resources and human needs for wood.** *Proc. World For. Congr.* No. 2, 1949 (13–33). [E.f.]

A survey and discussion by FAO of world resources and consumption by major categories and regions, with a note on possible future trends.

2202. La sylviculture en face des tendances de l'industrie du bois. **[Silviculture as affected by present day trends in wood industries.]** *Proc. World For. Congr.* No. 2, 1949 (34–48). [F.e.]

This report by FAO enumerates three definite trends:—(1) A world-wide increase in requirements for wood in all forms. (2) A relative increase in the use of 'disintegrated wood' as against sawn timber. (3) An increase in the demand for high-grade wood for plywood industries. (3) however, affects only a very small volume of wood compared with (1) and (2). Finally, (4) there are some signs of a trend in the direction of a greater relative use of hardwoods than in the past. It is held that satisfaction of trends(1)—(3) in general requires a selection system and intensive forest management rather than the extensive methods often employed hitherto.

2203. **Pulpwood: current consumption and future outlook: A report by FAO to the Montreal Conference.** *Unasylva* 3 (5), 1949 (178–83).

Includes statistics for world production and consumption.

2204. Federico, S. Produzione e consumo del legno in Italia. [**Production and consumption of wood in Italy.**] *Ital. agric.* 86 (8/9), 1949 (496–500). 6 refs. [It.] E.M.B.

Analyses and discusses statistics for the periods 1909–13, 1924–5, 1933–8 and 1947–8.

2205. Aguado Smolinski, J., and Foxa Torroba, J. de. El abastecimiento de maderas y la posibilidad de regularlo. [**Timber supply and the possibility of regulating it.**] *Manual Técnico del Servicio de Capitación y Propaganda, Ministerio de Agricultura, Madrid* (*Serie E*) No. 5, 1949. pp. 52. [Span.]

Gives an estimate of Spanish requirements of timber for mining constructions, sleepers, pulp, poles, packing cases and cooperage, and discusses the problem of making good the deficit between consumption and supply, by increasing home timber production.

2206. Skogindustrien i Finland. [**The timber industry in Finland.**] *Norsk Skogind.* 3 (10), 1949 (239–40, 242). [Nor.] P.R.

Gives figures for the production, home consumption and export of timber, mechanical, sulphite and cellulose pulps, paper, cardboard and wallboards.

2207. Holzexport aus den franz. Überseegebieten Westafrikas nach dem Kriege. [**Exports of wood from French territory in West Africa since the war.**] *Weltholzw.* 1 (7/8), 1949 (128–31). [G.] P.R.

2208. **Exploitation of the forests of British Guiana.** *Emp. For. Rev.* 28 (3), 1949 (208–9).

A criticism of an article of the same name by J. D. Gilmour. [Cf. *For. Abstr.* 11 (No. 1420).]

2209. **Indonesian timber.** *Timb. Tr. J.* 190 (3807), 1949 (1259, 1271).

Some estimates of the present situation in timber production.

2210. **Hardwood timber. Imports into United Kingdom from Canada 1920–1948. Softwood timber. Imports into United Kingdom from Canada 1920–1948.** *Quart. Rev. Timb. Developm. Ass., Lond.* 2 (6), 1949 (21–2).

Gives in graphs the volume in cu. ft. and the value in sterling of imports. Figures for hardwoods for 1920–32 exclude planed or dressed hardwoods, and for 1933–48 include hewn, sawn, planed and dressed. Figures for softwood include hewn, sawn, planed and dressed timbers, but exclude boxboards, pitwood and pulpwood, except that pulpwood is included for 1920–1933, and dressed timber is excluded for 1920–1932.

2211. **Timber prices.** *Quart. Rev. Timb. Developm. Ass., Lond.* 2 (5), 1948 (12–4).

Gives 2 graphs showing Russian timber prices 1923–47 and Finnish and Swedish timber prices 1920–47.

38. CONSTRUCTIONAL WORKS. ENGINEERING

See also *For. Abstr.* 11 (Nos. 1866, 1868).

2212. Stoy, W. Der Holzbau. [**Timber construction.**] Springer-Verlag, Berlin. 1944. pp. 164. 18 refs. [G.] [Technische Hochschule, Braunschweig.]

Contains sections on:—(1) timber and its preparation; (2) the basis of strength calculations; (3) joints: (*a*) the medium—glue, nails, bolts and connectors, (*b*) the type of joint; (4) load-bearing structures—beams and trusses; (5) towers, platforms and stands; (6) bridges; and (7) framework and scaffolding; with extracts from the relevant German standards. There are numerous illustrations of different designs.

2213. Roš, M. Materialtechnische Grundprobleme und Erfahrungen an ausgeführten Bauwerken in der Schweiz. [**Basic problems relating to materials and the results of experience with completed building constructions in Switzerland.**] *Ingenieur, 's-Gravenhage* 60 (47), 1948 (Mk. 123–40). 21 refs. [G.e.] L.S.

Surveys generally the experience and investigations of the Eidgenössische Materialprüfungs- und Versuchanstalt on the use of steel, wood, stone and concrete. Discusses the formulae for rupture and strength and shows the agreement between laboratory tests, calculations and practical experience. Gives the permissible stresses and safety factors against buckling, according to Swiss practice, for all materials mentioned. *From author's summary.*

2214. Roš, M. L'état actuel et perspectives des constructions en bois dans le domaine du

génie civil. **[The present position and future prospects of timber constructions in civil engineering.]** *C.R. Congr. int. Union For. Res. Organ., Zürich 1948*, 1949 (141–208). 11 refs. [F.f.g.e.]

A lecture, profusely illustrated with photographs, diagrams and graphs, reviewing the properties and uses of wood and glued laminated members (with special reference to those made with the urea-formaldehyde glue 'Melocol H') in structural engineering. The strength properties of standard high-grade wood are favourably compared with those of concrete and metals.

2215. GAUTHIER, P. Les assemblages collés dans la charpente en bois. **[Glued joints in wooden constructions.]** *Rev. Bois Appl.* 4 (9/10), 1949 (3–7). [F.]

2216. WALTERS, R. T. **Some notes on the use of glued laminated construction in buildings.** *Quart. Rev. Timb. Developm. Ass., Lond.* 2 (6), 1949 (14–6).

The main advantages of laminated construction are that: (1) components can be curved; (2) seasoning is easy because cross-sections are generally small; (3) smaller material can be used; (4) members can be built up to greater length and cross-section than could be obtained from solid material; (5) members can be tapered so that greatest strength is provided where it is needed; and (6) fire resistance is good, generally better than that of exposed steelwork. The main disadvantage, according to American experts, is cost. An account is given of construction methods in U.S.A. and Sweden, with photographs of individual examples.

2217. **[Testing the strength of a laminated arch.]** Press Release, Department of Mines and Resources, Canada. Sept. 1949. pp. 4.

Account of the design and loading of the arch erected at Ottawa by the Forest Products Laboratory [cf. *For. Abstr.* 9 (p. 392)]. After the full live load had been applied, the overload was applied in increments of 100 lb. A weight of 126,700 lb. was applied before failure occurred.

2218. **Connectors for timber.** *Brit. Stand.* No. 1579. 1949. pp. 27. Price 3*s*. P.R.

2219. TINNERMAN PRODUCTS INC., OHIO. **Self-clinching nails [recommended for use in very soft woods].** *Brit. Patent* No. 603,518, June 17, 1948. Price 2*s*. *Abstr.* in *Timber News* 57 (2124), 1949 (417).

38.2. *Building Construction. Foundations and Superstructures*

See also *For. Abstr.* 11 (Nos. 1786, 1854–5, 1866, 1868).

2220. MARKWARDT, L. J., and STRENGE, F. A. **Prefabricated wood house construction in the United States.** *Proc. World For. Congr.* No. 1, 1949 (163–76). 7 refs. [E.f.]

Reviews briefly costs, limiting factors, basic principles of design, materials and assembly joints.

2221. **Typical arrangement of joints of trussed rafters.** *Design Sheet, Timb. Developm. Ass., Lond.* No. 5, [1949?]. pp. 4. P.R.

2222. **T.D.A. roof type 'B'.** *Design Sheet, Timb. Developm. Ass., Lond.* No. 5–7, [1949?]. pp. 3 + 3 + 3. P.R.

Describes, with constructional diagrams, 3 roofs with a 35° pitch and maximum spans of 20 ft. 9 in., 24 ft. 3 in., 26 ft. 0 in., between walls.

2223. BUTTREY, D. N. **Plastics and building. (3) Panelling, tiling and floor covering.** *Ill. Carp. Build.* 138 (3764), 1949 (1520, 1522). P.R.

Includes information on the use of plywood and other wood laminates.

2224. LUCAS, E. **Practical points for builders. (7): Floors and beams. (8) Wall and ceiling linings.** *Ill. Carp. Build.* 138 (3754–5), 1949 (1118, 1120, 1122; 1146–8). P.R.

(7) Discusses stresses in beams and floors, and the design of floors with reference to strength requirements and, in the case of the ground floor in particular, to ventilation.

(8) Includes notes on types of fibreboards, their properties, and methods of use.

2225. **The design of timber floors to prevent dry rot.** *Digest, Building Research Station, London* No. 1, 1948. pp. 8. P.R.

Cf. *For. Abstr.* 10 (No. 2911).

38.3. *Road and Bridge Construction*

See *For. Abstr.* 11 (No. 1787).

2226. . FELLMETH, G. Waldwegebaufragen, mit besonderer Berücksichtigung des Grundmoränegebietes. **[Problems of forest road construction, with special reference to the ground-moraine region.]** *Forstw. Praxis, München* No. 2, 1948 (53 + 1 gph.). [G.] Price DM. 3.

A booklet intended as a severely practical digest of information on road-building (with special reference to roads for motor transport and to the ground-moraine region S. and W. of the Ammersee), designed for the inexperienced and containing sections on the surveying, construction and maintenance of new roads, the repair of old ones, and the use of machines in road works.

2227. N.S. 'Djungelvagnen' som stenbrytare. **[The jeep as a stone-lifter.]** *Skogen* 36 (18), 1949 (238). [Sw.]

Briefly describes, and illustrates with photos, a demonstration in Värmland of a Dodge jeep (85 h.p., with 8 forward and 2 reverse gears) fitted with a stout derrick arm and tackle whereby stones of 3 or in favourable circumstances even 4–5 metric tons can be lifted and transported to some suitable dump. Holes must first be drilled in the stones for the lifting tackle, a pneumatic drill being carried for this purpose on the jeep. The present cost per stone is put at *ca.* 3.5 Kr.

2228. PUTKISTO, K. Työtehon Suurnäyttelyyn tulevasta hevostalviteiden hoitokalustosta. **[Tools for maintaining sleigh roads, on view at the coming Exhibition of the Association for Work Efficiency Improvement.]** *Metsät. Aikak.* 1948 (10), (280–2). [Fi.]

Both Finnish and Swedish types are briefly described and illustrated, amongst the former being an improved horse-track snow plough, the Arnkil combined plough and grader; also various types of Finnish road-icing vehicles and water pumps.

2229. LUND, C. V. *et al.* **Report of Committee 7—Wood bridges and trestles.** *Bulletin [Proceedings] of the American Railway Engineering Association, Chicago* 50 (478), 1949 (453–6). L.R.R.S.

Adoption of recommendations by Madison will permit an increase over present practice of working stresses in timber by about 10% in bending and in horizontal shear, and 20% in compression perpendicular to the grain for seasoned timber used under continuously dry conditions. Results of stress and impact tests on timber structures in railway service are too few to allow of any definite conclusions, but preliminary observations are discussed.

4. FOREST INJURIES AND PROTECTION

2230. **Insects, diseases and parasites.** *Yearb. Agric. U.S. Dep. Agric.* 1949 (407–76).

A series of articles by different authors on some of the more important problems and achievements in controlling forest pests and parasites in the U.S.A.

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

2231. ZEIDLER, G. Die Fichtenwirtschaft in Südwestfalen: Gedanken zu den Katastrophen der letzten Jahre. **[The management of Norway Spruce in southern Westphalia: reflections on the catastrophes of recent years.]** *Forstarchiv* 20 (1/2), 1944 (15–29). 8 refs. [G.g.]

After a general outline of forestry conditions in the region and the rise of Norway Spruce cultivation, with notes on the catastrophic snow breakage, windthrow and wind breakage of 1936, 1939 and 1940, the author discusses problems of future management under the heads: Choice of species and of suitable races of Norway Spruce; windfirm belts or margins as a means of protection; artificial regeneration; natural regeneration; underplanting; and fellings (both intermediate and final). In general, he concludes that although Spruce must continue to be one of the main species grown, large-scale pure plantations and clear felling must give way to more flexible treatments, varying according to site but chiefly involving group mixtures of Spruce with hardwoods and Larch, or, on wet sites with little rooting depth, hardwoods alone. Conversion of the pure Spruce stands will take a long time, but a start should be made on the areas devastated by snow and wind damage.

2232. VAJDA, Z. Koji su uzroci sušenju hrastovih posavskih i donjopodravskih šuma? **[What are the causes of the drying up of the Oak forests of the Sava and Lower Drava basins?]** Šumsko-zaštitne mjere u posavskim i donjopodravskim hrastovim šumama. **[Protective measures in the Oak forests of the Sava and Lower Drava basins.]** *Sum. List* 72 (4; 5/6), 1948 (105–13; 168–71). [Croat.]

The author attributes the wholesale drying up of the bottomland Oak (*Q. robur* s.s.) in the past 40 years primarily to a general climatic change, bringing warmer and drier conditions that favoured harmful competitors. In addition, the management of these forests disregarded their biological needs, forest grazing was applied unscientifically and land was unwisely drained for agricultural purposes, a combination that, under certain climatic conditions, proved fatal. Remedial measures proposed are the conversion of the Oak stands to a mixed culture of the *Querceto-Genistetum elatae* or *Querceto-Carpinetum croaticum* type, having a protective undergrowth; the encouraging of a balanced forest fauna, especially birds; remedying harmful drainage practices; and stopping forest grazing except for pannage.

42.2. *Temperature Influences*

See also *For. Abstr.* 11 (No. 1592).

2233. RUDOLF, P. O. **Recovery of winter injured Pine.** *Tech. Notes Lake St. For. Exp. Sta.* No. 323, 1949. p. 1.

Data on recovery of 19-year-old *Pinus resinosa* and *P. sylvestris* in the Lake States, from injury sustained in the severe winter of 1947–8. Trees with ¼ or less of their foliage injured showed excellent recovery; most of those with less than ½ their foliage injured recovered satisfactorily; recovery was usually unsatisfactory where ¾ or more of the foliage was injured.

2234. FOURCHARDIÈRE, DE LA. La sécheresse de 1949 en Haute Bretagne. **[The drought of 1949 in upper Brittany.]** *Rev. for. franç.* No. 6, 1949 (271–3). [F.]

From August 1948 to the end of July 1949, rainfall in Brittany amounted to no more than 411.5 mm. compared with the annual average of 700 mm., and this followed more than two years of exceptional dryness. The effects on forest vegetation are noted. No particular injury was observed until July 1949, following 2 months' exceptional drought (only 9 mm. of rainfall in June and July). Many young plantations then died quite suddenly. Mature trees growing in forest stands appear to have suffered hardly at all, but the trees in hedges and fields,

which are very numerous, present an extraordinary appearance. In many places perfectly vigorous trees withered in a few weeks or even days. The most susceptible species appears to be the Sweet Chestnut; coppice growth has suffered relatively little, but the standards have withered rapidly, the leaves turning white without any previous fading; quite large twigs have also died, and the buds are dried up, so that there is little hope of the trees recovering. After the Chestnut, the chief sufferers have been the Oak and Birch. Beech and Holly, which require much atmospheric humidity, have nevertheless proved more resistant than the above-mentioned species; the leaves of the Beech turned colour as in autumn, desiccation was much slower, the buds appear to be well formed and healthy, and even the small twigs are still green. Poplars, apart from plantations made in the spring, have not suffered. Coniferous species do not show much sign of injury, with the exception of *Pinus pinaster* on rocky sites, on which only the needles of the last two years are still green.

2235. Konis, E. **The resistance of maquis plants to supramaximal temperatures.** *Ecology* 30 (4), 1949 (425–9). 12 refs.

A simple field method is described for determining the degree of resistance of plants to temperatures above the maxima encountered in their natural habitats. Its advantages, disadvantages, and applications are discussed. This method consists essentially in inserting a living, unsevered branch of the selected plant into a bottle coated with lamp-black and plugged with a halved cork provided with two holes, one for the stalk and one for a thermometer. The temperature within the bottle, raisable in this way above 60° C. owing to the high absorption of the sun's rays and the absence of convection, was examined every 15 minutes. From a number of maquis plants in Palestine, tested in this way, it was found that the leaves of *Rhamnus alaternus*, *Quercus calliprinos*, *Phillyrea media*, *Arbutus andrachne*, *Ceratonia siliqua*, *Laurus nobilis*, *Pistacia palaestina*, *Cercis siliquastrum*, and *Rhamnus palaestina*, are capable of withstanding, for long periods, temperatures markedly higher than the maxima encountered by these plants in nature. It was observed that immature portions of plants are more vulnerable than adult portions, and that the evergreens studied bear high temperatures better than the deciduous maquis species.

42.3. *Precipitations*

2236. Waterer, R. R. **Snow damage.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (6–7).

Pinus halepensis is susceptible to snow breakage, and both poles and large trees are sometimes badly broken. Early in 1948 a peculiar set of circumstances did exceptional damage in the higher elevations of Troodos forest. A heavy fall of snow was immediately followed by a severe drop in temperature, which froze the deeply piled snow solidly on to the crowns of the trees. This was followed, the same night, by an abnormally fierce gale, which in the more exposed places tore thousands of trees to pieces. Many were snapped half way up the stem, while others were stripped of their heavily laden branches. Very few were uprooted, which proves how windfast are the open stands of Pine forest at Troodos.

42.5. *Chemical Influences. Nutrient Deficiencies*

2237. Katz, M. **Sulfur dioxide in the atmosphere and its relation to plant life.** *Industr. Engng. Chem.* 41 (11), 1949 (2450–65). 122 refs. [Defence Research Chemical Laboratories, Ottawa.] P.R.

The literature on the influence of SO_2 on growth of trees and crop plants and the symptoms and diagnosis of injury, is briefly surveyed, and experimental studies on trees and crop plants are described. Conifers in their natural habitat were found to be much more susceptible in spring and early summer, most of all from April to May; the trees were more susceptible in daylight than in darkness. Transplanted conifers were much more susceptible than those in their natural habitat, but were extremely resistant to SO_2 during the autumn and winter months. Larch was the most susceptible of the 11 species tested. Seedlings of Douglas Fir and Yellow Pine were much more susceptible than older trees. In absorption experiments conifer needles were only injured when there was an appreciable increase in S content over a short period. Graphs and tables include those showing the effect of smelter smoke on absorption of SO_2 by Douglas Fir, Yellow Pine and deciduous trees.

43. FOREST FIRES

2238. Uslu, M. Die Waldbrandbekämpfung als Forstschutzaufgabe unter besonderer Berücksichtigung der deutschen und türkischen Verhältnisse. **[Forest fire control as a task of forest protection, with special reference to conditions in Germany and Turkey.]** J. Neumann, Neudamm. 1942. pp. 155. 153 refs. [G.g.]

2239. Renard, M. Les feux de brousse du Soudan. **[Brush fires in the French Sudan.]** *Bull. agric. Congo belge* 40 (2), 1949 (1919–32). [F.]

An account of the causes, effects, and attempts at control, of brush fires in the French Sudan.

2240. Masson, H. La température du sol au cours d'un feu de brousse au Sénégal. **[The temperature of the soil during a brush fire in Senegal.]** *Bull. agric. Congo belge* 40 (2), 1949 (1933–40).

Measurements were made during and after typical brush fires, mainly of grass, in Senegal. It was found that the surface of the soil during a fire might exceed 800° C., and that such high temperatures may persist for an appreciable length of time. It seems clear that almost all living seeds on the surface of the soil would be destroyed. The degree of burning beneath the surface depends largely on the nature of the soil. In a sandy soil it was very slight even at a depth of 2 cm. and probably insufficient to harm seed.

2241. **Report of the Woodlands Section field meeting on fire protection.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1042 (F–3), 1949. pp. 46.

Includes papers and discussions on forest protection standards, fire protection research, training of fire fighting crews, slash burning, errors in fire fighting, and descriptions of some new equipment.

2242. Beall, H. W. **Report on performance of German 10-metre pack-set radio under forest conditions.** Dominion Forest Service, Ottawa, Canada. 1946. pp. 9.

43.0. *Predisposing Factors and Causes*

2243. **Fuel moisture indicator sticks.** *Rep. B.C. For. Serv. 1948*, 1949 (42).

In an attempt to reduce the seasonal weight-loss in fuel-moisture sticks, possible reasons for the weathering were considered, and it was felt that the slightly rough surface of the ½-in. dowelling might be responsible. To test this, matched pairs of sticks were exposed and the amount of weathering checked at regular intervals. One set of each pair was sanded smooth with very fine sandpaper and the other left unsanded. With the sanded sticks, the weight-loss seemed to be reasonably steady over the season, whereas the unsanded sticks showed their greatest loss-of-weight rate towards the end of the season. At the end of the season, the total weight-loss was very nearly equal for both types, being slightly more for the sanded set.

43.1. *Protective Measures (including Controlled Burning)*

2244. Letouzey, M. Feux précoces au Cameroun. **[Early burning in the French Cameroons.]** *Bull. agric. Congo belge* 40 (2), 1949 (1913–8). [F.]

The attempt to protect the woody species of the savanna by fire exclusion has been abandoned in favour of prescribed burning at the beginning of the dry season. The success of this policy is described.

2245. Pearson, T. V. **Will exhaust gases help put out fires?** *Fire Control Notes* 10 (4), 1949 (10–1).

Some experiments were made in the summer of 1946 to observe the effectiveness of hot exhaust gas in smothering small fires. There appears to be some evidence that such gas, undiluted with air, or diluted with such an amount of cold air as will limit the oxygen content of the mixture to a point below that required to support burning (about 11%) has a smothering effect that will control fire in some light flash fuels. What is needed is a practical method of cooling the exhaust gas, without increasing the oxygen content beyond the tolerable point, in order to gain greater effect on hot fires in heavier fuels.

2246. **Effect of altitude, length of hose line and head on performance of forest fire pumping units. Unit G.** *Suppl.* No. 1, 1947, pp. 7, to *For.-Fire Res. Note For. Serv. Can.* No. 13.

Data from tests of an additional pumping unit [cf. *For. Abstr.* 9, No. 1880)]. Supplements to Research Note No. 13 will be issued as further units become available for testing.

2247. **['Drop-on' tanker unit.]** *Rep. B.C. For. Serv. 1948*, 1949 (44–5 + 2 photos, 4 dgms.).

Detailed description, with photographs and diagrams, of a tanker unit for forest-fire suppression, designed by the B.C. Forest Service. The tank and pump may be removed or installed in a few minutes with proper lifting tackle, so that the vehicle can be used for general purposes during the off season.

43.3. *Fire Damage*

See also *For. Abstr.* 11 (No. 1756).

2248. **Forest fire losses in Canada 1948.** For. Serv. Can. 1949. pp. 6 + 5 tbls., 4 dgms.

Statistical records of forest fire losses in Canada have hitherto been included in the Annual Reports of the Dominion Forest Service. This information is now issued as a separate leaflet, in the hope that it will thus receive wider circulation.

2249. CRAIG, R. B., FRANK, B., HAYES, G. L., and MARBURG, T. F. **Fire losses and justifiable protection costs in the southwestern coal section of Virginia.** *Stheast. For. Exp. Sta.* 1946. pp. 44 + 2 maps.

2250. CRAIG, R. B., MARBURG, T. F., and HAYES, G. L. **Fire losses and justifiable protection costs in the coastal plain region of South Carolina.** *Stheast. For. Exp. Sta.* 1946. pp. 46 + 2 maps.

2251. WRIGHT, W. G. **Values and losses of standing timber in forest fire insurance.** *Pulp Paper Mag. Can.* 50 (11), 1949 (156, 158–9).

Discusses a hypothetical and simplified case of insurance of standing timber by a pulp-and-paper company, in order to illustrate ways of estimating the value of the timber, and the amount of loss against which the company will wish to protect itself.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

See also *For. Abstr.* 11 (Nos. 1600, 1809–10).

2252. W[YATT]-S[MITH], J. **Natural plant succession.** *Malay. Forester* 12 (3), 1949 (148–52).

Several plots have been formed in Kroh Forest Reserve, to study the natural plant succession on abandoned dry paddy land, the forest having been cleared about the beginning of 1945 and the land cultivated for 1–2 years. The following facts have already been established. (1) *Imperata cylindrica* will invade well established *Paspalum conjugatum* and suppress it. (2) *Mikania scandens* does not appear to have any restraining effect on *I. cylindrica*. (3) *I. cylindrica* can suppress young *Eupatorium odoratum*. (4) *Trema* spp. do not grow well on abandoned, degraded soil (farmed for 18 months or more) and do not generally live for more than 2 years. (5) Young *belukar* will form a tall, closed canopy in two years on lightly cultivated land that has not become overdegraded, and will suppress *Paspalum*, *Imperata*, *Mikania* and *Eupatorium*. (6) *Glochidion sericeum*, although forming a very dense, early shade, and suppressing all grasses and creepers, also suppresses valuable species. (7) *Mallotus macrostachys* and *Macaranga gigantea* form a quick, high, closed canopy, which is not too dark to prevent the establishment and growth of jungle species, but is yet dark enough to suppress *Mikania*, *Eupatorium*, and grasses. [Cf. *For. Abstr.* 11 (No. 1751).]

2253. GREENHAM, C. G., and COLE, D. J. **Diagnosis of death in roots.** *Nature, Lond.* 164 (4172), 1949 (669). [Division of Plant Industry, Canberra.]

The authors have devised a simple electrical method for determining the depth to which roots or underground stems of perennial weeds have been killed following the application of a poison to their tops. The equipment, consisting of a probe and a portable A.C. bridge, measures equivalent parallel resistance (*Rp*) and capacitance (*Cp*). On ascending from a lower, healthy portion of a root poisoned at its top, *Rp* decreases to a minimum and then increases. The decrease is attributable to the tissues being progressively more injured by

poison as the probe is moved upwards. The subsequent increase in resistance is attributable to the dead tissues having become desiccated. The lowest point of dead tissues is usually within ¼ in. of the spot at which resistance is at a minimum.

2254. DAVID, R. Nouveaux essais de débroussaillement chimique. **[Further experiments in the chemical destruction of weeds and shrubs.]** *Bois et Résineux* No. 1506, 1949 (1). [F.]

[For an earlier report, see *For. Abstr.* 11 (No. 1449).] Spraying with 1% solution of Weedone 40 (containing 40% of 2,4-D) killed the aerial parts of *Calluna*, *Erica*, and *Ulex* spp., but only partially destroyed grass. A 2% solution was even more effective, but did not completely kill the grasses. Vegetation sprayed in the previous year sprouted feebly and it is believed that a second spraying would more or less suppress it for several years. Comparable results were obtained with Débroussaillement 32, another proprietary preparation of 2,4-D, which was more successful than Weedone against *Parietaria*. In both these oily preparations the active principle is the ethyl ester of 2,4-D. Experiments with sprays made from various preparations in powder form, which are usually salts of 2,4-D, gave very inferior results.

2255. PRIDHAM, A. M. S. **Response of woody ornamentals to 2,4-D.** *Proc. 2nd ann. Ntheast. Weed Control Conf. 1948*, [1948] (122–3). O.R.E.

Experiments showed that 2,4-D spray injury to ornamental trees, when spraying lawns etc., can be minimized or eliminated by spraying during the dormant period.

2256. MELANDER, L. W. *et al.* **Résumé of 1948 progress made in research on eradication of woody plants.** *Res. Rep. 5th ann. Nth. Cent. Weed Control Conf. 1948*, pp. 18 + 19 pp. of tbls. O.R.E.

This résumé (3 pp.) is supported by abstracts of 37 detailed reports from a number of research institutions, which it summarizes. All reports deal chiefly with the use of 2,4-D and 2,4,5-T. [Cf. *For. Abstr.* 11 (No. 1447).] Among the outstanding results is the establishment of a more clearly defined pattern of the selective action of 2,4-D on woody plants. More experiments are needed before full credence can be given to the claims made for 2,4,5-T. Most experiments were made with foliage sprays or cut-surface treatment, but some by placing chemicals in gashes cut in trees. Ammate was used successfully in this way on several species of tree, but results with 2,4-D were inconclusive.

A successful 2,4-D treatment of Sage-brush [*Artemisia* sp.] on the western ranges was developed during 1948. One pound of 2,4-D (acid equivalent) sprayed from aeroplanes at a total cost of $2.00/acre effectively controlled Sand Sage.

Thousands of acres of rights-of-way, especially along power lines, were sprayed with 2,4-D during 1948. [Cf. *For. Abstr.* 10 (No. 2935), 11 (No. 1446).] From experiments made by a large power company it is concluded that all woody plants normally found on rights-of-way in Western Pennsylvania can be controlled by combinations of 2,4-D and 2,4,5-T esters, except Basswood, Ash, and Beech. Large trees and coarse brush must be cut before the application of sprays. The reduction in the amount of regrowth from cut-surface treatment is above 60%—a good demonstration of the advantage of combining mechanical and chemical methods for the control of woody growth.

The selectivity of herbicides such as 2,4-D is proving a useful tool in the elimination of competitive useless shrubs and trees that impair the successful regeneration and growth of valuable forest trees. In the Great Lakes Region, 2,4-D appears to be very useful in controlling undesirable shrubs such as Hazel brush. [Cf. *For. Abstr.* 9 (No. 1881), 10 (No. 1402).]

Experiments are reported in detail of tests of the efficacy of selective herbicides on the following species:—*Symphoricarpos* spp. (killed if sprayed in the succulent stage with high concentrations (2,000 p.p.m.) of 2,4-D); *Maclura pomifera* (2,4,5-T will kill under certain conditions, and a combination of 2,4-D and 2,4,5-T (3,000 p.p.m.) as a foliage spray successfully killed it at all stages); many species of *Salix* now appear to be more easily killed with 2,4-D than has been indicated in the past, especially at higher concentrations (2,000 p.p.m.) [cf. *For. Abstr.* 9 (Nos. 1265–6)], and there is some evidence that they are also sensitive to 2,4,5-T; *Crataegus* spp. are not readily killed with foliage sprays of 2,4-D, but one

report indicates that a combination of 2,4-D and 2,4,5-T will kill some species in the succulent stage; *Rubus* spp. appear to be tolerant to 2,4-D, but there are indications that Blackberries may be sensitive to 2,4,5-T, and both Blackberries and Raspberries to combination sprays of 2,4-D and 2,4,5-T. Dewberries appear to be resistant. [Cf. *For. Abstr.* 9 (No. 1265).]

The following are the titles and authors of reports summarized above, and some others, abstracts of which are appended to the résumé:– 'Comparison of 2,4-D, 2,4,5-T, and ammonium sulfamate applied to Osage Orange' (*D. L. Klingman*). 'Effect of 2,4-D on Western Snowberry [*Symphoricarpos occidentalis*]' (*W. J. Breakey*). 'Control of Buckbrush [*Symphoricarpos orbiculatus*] with 2,4-D and 2,4,5-T' (*F. W. Slife*). 'Eradicating Snowberry [*Symphoricarpos occidentalis*] with 2,4-D' (*W. J. Breakey, H. E. Wood and J. J. Bourne*). 'Eradicating woody growth with 2,4-D and 2,4,5-T' (*H. E. Wood, J. J. Bourns and L. Playfair*)—[Experiments on keeping open power-line rights-of-way in Manitoba; satisfactory control was obtained except on *Salix discolor* and *Cornus* sp.; the turbine sprayer was most effective for application]. 'Range improvement through Sagebrush control with 2,4-D in the Southern Great Plains' (*E. H. McIlvain and D. A. Savage*). 'Results of 2,4-D foliage spray on Hazel brush [*Corylus rostrata*]' (*R. A. Jensen*)—[An infested area was sprayed with 2,4-D acid in a concentration of 1,000 p.p.m. with a power sprayer at 200 lb. pressure, in Aug. 1946 and again in Aug. 1947. In spring 1948, the area was scalped and planted with 2/2 Jack Pine and Red Pine at 5 × 5 spacing. The dead Hazel stems did not seriously impede planting, as they were dry and broke easily. Although the Hazel brush was not killed, the vigour of the sprouts was much reduced.] '2,4-D applied to cut surfaces of Chinese Elm, Hackberry and Wild Grape' (*G. Viehmeyer*)—[*Ulmus pumila* was in most cases killed by a single application, but *Celtis occidentalis* appeared to be resistant]. 'Killing woody and herbaceous vegetation in preparation for forest planting on brushy areas'; 'Release of Red Pine plantation from brush sprouts and herbaceous vegetation'; 'Release of natural White Pine reproduction from brush'; 'Determination of sprays on *Berberis canadensis* and *B. fendleri*' (*P. J. Zehngraff*)—[Foliage sprays were effective only on plants in full vegetative growth; treatment of cut surfaces of canes was uniformly successful.] 'Air blast application of ammate for the control of scrubby Oaks' (*H. M. Elwell and M. B. Cox*)—[Good control was obtained at a rate of 50 gal. of liquid and 100 lb. ammate/acre, using an air-blast sprayer; to obtain comparable results with a hydraulic type of sprayer required 300 lb. ammate in 300 gal. of water/acre]. 'Control of Mesquite by 2,4-D and 2,4,5-T' (*C. E. Fisher et al.*) [cf. *For. Abstr.* 10 (No. 684)]. 'Alder brush eradication tests'; 'Tests of sprays along telephone lines to control sprout and seedling growth of native trees . . . in N. Wisconsin' [includes a table showing relative susceptibility of a number of species] (*J. H. Stoeckeler*). 'A comparison of Na salt and isopropyl ester of 2,4-D at 3 rates and isopropyl ester of 2,4,5-T at one rate of acid per acre to control Salt Cedar [*Tamarix gallica*]' (*C. W. Bowser*)—[It is concluded that two treatments, each of 4 lb. acid 2,4-D in 15 gal. liquid per acre, are necessary during the growing season, to eradicate mature Salt Cedar].

2257. COULTER, L. L. **Killing large Willow stumps with 2,4-D.** *Abstr.* in *Res. Rep. 5th ann. Nth. Cent. Weed Control Conf. 1948*, Sect. VI, [1949]. [Dow Chemical Co., South Haven, Mich.] O.R.E.

Stumps of several large Willows, 3–5 ft. in diameter, were sprayed with 10,000 and 30,000 p.p.m. of isopropyl ester of 2,4-D in No. 2 fuel oil in May 1948. In Oct. 1948 suckers from untreated stumps were 10–15 ft. high, those from stumps treated with the lower concentration were 1–2 ft. long with very thick stems and proliferated bark, while no suckers had developed on stumps treated with the higher concentration, which appeared to be completely dead.

2258. WOOD, H. E. **2,4-D used to control woody plants and weeds in drainage and irrigation ditches, on roadways etc.** *Proc. 1st West. Canad. Weed Control Conf. 1947*, Sect. J, [1948?] O.R.E. WALLACE, G. **Use of 2,4-D on drainage and irrigation ditches, highways, etc.** *Proc. 2nd West. Canad. Weed Control Conf. 1948*, [1949?] (59–60). O.R.E.

The Manitoba Drainage Maintenance Board, charged with the up-keep of several hundred miles of open drainage ditches, in which Willows (mostly *Salix amygdaloides*) were

troublesome and costly to eradicate mechanically, experimented in 1947 with 2,4-D. Spraying was carried out with a Buffalo Turbine on about 100 miles of ditches, totalling 540 acres, overgrown with Willow up to 20 ft. or more in height. The machine was mounted on a ¾-ton truck and operated by 2 men, one driving the truck, the other operating the turbine. Both the ester and amine salt formulations were used, at about 1½ lb. acid/acre applied at about 10 gal. water solution/acre. Early indications were that all growth was killed to well below ground except where the spray had missed parts of the growth. Inspections in 1948 for regrowth, showed about 10% in Willows and 20–30% in Poplar and Maple. About the same % of kill was obtained by each of the formulations used. During 1948 a test plot of about 12 acres (2 miles) of Willows 15–20 years old and 10–15 ft. high was treated with an ester formulation at 1½ lb. of acid and 5 gal. light fuel oil/acre. The kill on this plot, 6 weeks after treatment, was almost 100%.

It is concluded that woody plant growth in drainage channels and on roadsides can be effectively and economically controlled by treatment with 2,4-D formulations at a cost of *ca.* $14.00/acre for 2 applications compared with *ca.* $50.00/acre for mechanical control. Chemical control is also more permanent, as it kills the roots of the plants. A re-treatment, 1–2 years after the first application, is advisable to assure a 100% kill on regrowth and plants missed before. A turbine-type sprayer with side delivery is the most suitable for drain and roadside treatment.

2259. FISHER, C. E., and YOUNG, D. W. **Some factors influencing the penetration and mobility of chemicals in the Mesquite plant.** *Proc. 5th ann. Nth. Cent. Weed Control Conf. 1948*, [1949] (197–202). 17 refs. O.R.E.

Mesquite (*Prosopis juliflora*) has a well-defined dormant-bud zone on the underground stem. These buds, 3–8 in. below ground level, must be destroyed, or the new sprout growth will be more objectionable than the original plant. True roots are free of dormant buds and do not sprout. Extensive trials from 1945 to 1948 indicate that the degree of absorption and translocation of 2,4-D and 2,4,5-T sprays, is governed largely by duration of moist contact with the leaf surface. Top kill could be increased by varying the formulations and concentrations of 2,4-D and 2,4,5-T and by substituting various oils for water as diluent, but no appreciable increase in translocation resulted. Comparison of 2,4-D and 2,4,5-T in the isopropyl ester formulation showed that the latter was considerably more toxic and travelled more readily to the bud zone. A note is also given on techniques for observing translocation and on soil and basin treatments.

2260. MARTIN, S. C. **Controlling Mesquite with diesel oil.** *Res. Notes Sthwest. For. Range Exp. Sta.* No. 115 (rev.), 1949. pp. 4. Revision of an earlier publication. [Cf. *For. Abstr.* 10 (No. 684).]

2261. HANSON, N. S. **Effect of treatments with ammonium sulphamate and sodium chlorate on stumps of Cottonwood (*Populus deltoides*).** *Abstr.* in *Res. Rep. 4th ann. Nth. Cent. Weed Control Conf. 1947*, [1948] (260). [Nebraska Experiment Station, Lincoln, Nebraska.] O.R.E.

A series of stumps, 24–36 in. in diameter, were treated with ammonium sulphamate (ammate) on March 15, 1947, after the trees had been cut in Nov. 1946, using 4 methods of application (on 2 stumps each):—(1) cambium treatment in ½-in. holes, 8 in. apart and 4 in. deep, about 1 lb./stump; (2) as (1) but holes ¾ in. wide and 1½ lb./stump applied; (3) about 2 lb./stump as dry cambium treatment over top of entire cambium ring; (4) same as (3) except that the chemical was dissolved to a concentrated solution and poured over the cambial ring; there were also (5) untreated controls; (6) method (3), but with $NaClO_3$, the stump being burned 10 days after treatment. Observations in Oct. 1947 showed:—treatment (1), one cambium sprout on each stump, 2 root sprouts on one and none on the other, all sprouts 4 ft. high; (2) no cambium sprouts on either stump, 3 root sprouts 5 ft. high on one, and one root sprout 1 ft. high on the other; (3) both stumps dead; (4) no cambium sprouts, but 2 root sprouts 2 and 4 ft. high on each; (5) untreated controls had 7 cambial and 3 root sprouts 3–6 ft. high; (6) the stump was dead.

44.3. *Fungi*

See also *For. Abstr.* 11 (Nos. 1716, 2198).

2262. BIER, J. E. **Some common tree diseases of British Columbia.** Dep. Agric. Can. [*n.d.*]. pp. 48.

Descriptions and illustrations of the more important diseases of conifers in British Columbia.

2263. Oechslin, M. Bespritzungs- und Bestäubungsversuche gegen die *Herpotrichia nigra*. [**Research into spraying and dusting against *Herpotrichia nigra*.**] *Schweiz. Z. Forstw.* 100 (5), 1949 (229–31). [G.]

Experiments have shown that in the application of copper preparations for control of *Herpotrichia nigra* in mountain conifer nurseries, dusting is preferable to spraying, both because the transport of water is difficult and because dusting gives more complete coverage, particularly to the underside of the needles. The powder used for dusting can be made rainproof by the addition of an adherent manufactured by the Ciba A.G., but it is desirable that there should be no rain for 24–48 hours after the dusting has been carried out.

2264. **Pathogen: *Polyporus schweinitzii* Fr. Hosts: Pine, Spruce, etc.** *Distribution Maps of Plant Diseases* No. 182, (rev.) 1949. p. 1 + map. [Commonwealth Mycological Institute.]

2265. Jørgensen, C. A., and Treschow, C. Om Bekæmpelse af Rodfordærveren (*Fomes annosus* (Fr.) Cke) ved Fladrodplantning og ved Kalk- og Fosfattilskud. [[**Theoretical basis, plans for and description of experiments on**] **the control of *Fomes annosus* by flat-rooted planting and by applications of lime and phosphate.**] *Forstl. Forsøgsv. Danm.* 19 (3), 1948 (253–84). 18 refs. [Dan.e.]

The authors review literature on *F. annosus* with chief reference to their earlier work [cf. *For. Abstr.* 1 (188, 294)], which suggested that means of controlling attacks on Norway Spruce in Denmark might be found in (*a*) raising the pH of the soil above 6·0, beyond which value the growth of the fungus in culture had declined rapidly, and (*b*) finding a planting method that discourages the formation of a tap root through which, on its death at 20–30 years of age, the fungus is able to invade the tree.

Field experiments, described fully in this paper, were started in 1942 to examine the effects of lime and phosphate applications to the planting hole, and to compare the Norwegian method of superficial planting with roots spread flat out, with ordinary planting in well dug holes. As *Fomes* attacks do not usually become prevalent in plantations younger than 25–30 years, decisive results cannot be obtained before that age. Meanwhile, preliminary results have shown that the pH can be considerably raised, for a time at least, by local applications of lime or phosphate and that flat-rooted planting will work under Danish conditions, giving a flat superficial root system without a tap root.

2266. Siggers, P. V. **Weather and outbreaks of the fusiform rust of Southern Pines.** *J. For.* 47 (10), 1949 (802–6). 8 refs.

Study of meteorological data for 1937–40 and in other years, indicated that warm weather in late winter, and particularly in March, provided favourable conditions for the uredial stage of the southern fusiform rust (*Cronartium fusiforme*) on Oaks. Exceptionally warm weather in the South-eastern U.S. in February and March 1938, followed by cool, damp weather in April, resulted in serious outbreaks of the disease in Pine nurseries. Losses in the nurseries were lowest in 1937, when unusually cold weather in March undoubtedly delayed peak production of sporidia until May, a warm, dry month. Temperature in late winter and March appeared to govern the quantity of urediospores produced, by retarding or stimulating the development of Oak leaves according as it was low or high. There was little evidence that spore production was affected by variations in rainfall in the first quarter of the year. Spraying to control the disease would have most effect if treatments were: (1) deferred until the fruiting stages of the rust first appeared on leaves of Oaks in the neighbourhood of the nursery, (2) deferred when daily average temperatures are not above 56° F., or (3) timed so as to precede periods of general precipitation or of high humidity.

2267. Matthews, D. N., and Hutchison, S. B. **Development of a blister rust control policy for the national forests in the Inland Empire.** *Sta. Pap. Nth. Rocky Mt. For. Range Exp. Sta.* No. 16, 1948. pp. 116. 56 refs.

2268. Ibberson, J. E. **A preliminary report on the diseased condition of Red Pine in southeastern Pennsylvania.** *Pa. For. Wat.* 1 (6), 1949 (124–5, 141). 7 refs.

An investigation is being made into the decline of *Pinus resinosa* plantations in south-east

Pennsylvania. It is believed that the species is here beyond its range and that the primary cause of failure is a root rot caused by *Phytophthora cinnamomi*.

2269. FOSTER, R. E., and HURN, D. R. **A preliminary report on deterioration in the Western Hemlock/Douglas Fir type on Lower Vancouver Island following attack by the Western Hemlock looper (*Lambdina F. lugubrosa* Lepidoptera, Geometridae).** *For. Chron.* 25 (3), 1949 (202–4).

About 400 million bd. ft. of timber have been killed by looper attack, and investigation of the condition of a random sample of 106 insect-killed trees shows that:—(1) 98% of the trees have become infected with sap rot. (2) The % of the merchantable bole length in which decay was recorded increased progressively from 40 in the 15-in. to 83% in the 40-in. diameter class. (3) The incidence of infection increased markedly with increase in height. (4) Average radial penetration of decay was 1·5 in. and penetration as deep as 6 in. was measured in some cases. (5) The % of merchantable volume occupied by decay decreased slightly with increasing diameter; decay in the 106 trees averaged 22·4% of the gross merchantable volume. (6) The following decay organisms are present:—*Fomes pinicola, Ganoderma oregonense, G. applanatum, Poria tsugina, Polyporus abietinus* and *Stereum sanguinolentum*. The greatest proportion of decay (a brown cubical rot) was caused by *F. pinicola*.

2270. TOOLE, E. R. ***Fusarium* wilt of Staghorn Sumac [*Rhus typhina*].** *Phytopathology* 39 (9), 1949 (754–9). 2 refs.

A vascular wilt of *Rhus typhina* caused by *Fusarium oxysporum* f. *rhois* has been found in Virginia and Connecticut. It is characterized by wilting of the foliage, soon followed by death of the affected plant. Inoculation experiments indicate that this fungus will wilt *R. typhina*, but not *R. copallina, R. glabra, R. toxicodendron*, and *Albizzia julibrissin*, and that there are possibly different strains of *R. typhina*, varying in wilt resistance.

2271. WYSONG, N. B. **Oak wilt disease menaces nation's trees.** *Trees, Cleveland (Ohio)* 9 (6), 1949 (6–7, 22).

A review of the spread of *Chalara quercina* Oak wilt in the U.S.A. The disease appears to be spreading much more rapidly than it did a few years ago.

2272. MALLAMAIRE, A. Note sur quelques maladies des légumineuses d'ombrage et de couverture en Afrique occidentale. **[Note on some diseases of leguminous shade trees and cover crops in West Africa.]** *Bull. agric. Congo belge* 40 (2), 1949 (1831–43). 9 refs. [F.]

2273. GRASSO, V. L'oidio dell'Eucalipto. **[Eucalyptus mildew.]** *Nuovo G. bot. ital. (n.s.).* 55 (4), 1948 (581–4). 6 refs. [It.] O.B.D.

The causal organism of a mildew appearing on nursery stock of *Eucalyptus rostrata* at Pistoia was identified as a species of *Oidium*. The author is inclined to identify this with *O. eucalypti* found on Eucalypts in Denmark and *O. evonymi-japonicae* found on Eucalypts in Poland.

2274. COUCH, J. N. **Two species of *Septobasidium* from Mexico with unusual insect houses.** *J. Elisha Mitchell sci. Soc.* 62, 1946 (87–94 + 2 plates). L.S.

Describes 2 new species, *S. fraxini*, found on *Fraxinus*, and *S. soleare* found on an unspecified deciduous tree, both fungi characterized by unusual features in the insect houses of the scale insects associated with them.

2275. **Watermark disease of the Cricket Bat Willow.** *Leafl. For. Comm., Lond.* No. 20, (revised) 1949. pp. 5. 8 refs.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

See also *For. Abstr.* 11 (Nos. 1719, 1770–1, 1813).

2276. LESSER, M. A. **Animal repellents.** *Soap* 25 (9), 1949 (123–5, 127, 149, 151). 22 refs. P.R.

The literature relating to animal repellents is surveyed. Among the compounds suggested for keeping rabbits from gardens and orchards are: (1) a mixture of essential oil of camphor and oil of turpentine with paraffin oil; (2) a commercial product consisting of an essential oil dissolved in alcohol, sprayed on foliage, grass or fences and lasting from 10 days to 3 weeks; (3) nicotine sulphate of the usual

insecticidal strength sprayed on plants every few days after rains; (4) a solution of 2 teaspoonfuls of 'Black Leaf 40' to 1 gal. of soapy water or a soapy water spray made with brown laundry soap. Other suggestions are dusting the plants with powdered lime or sulphur, and spraying with 3 oz. Epsom salts to a gallon of water. A rabbit-repellent paint 96*a*, for application to the bark of dormant trees, has been found effective and is being manufactured and sold to the public by the Fish and Wildlife Service at its supply depot at Pocatello, Idaho. It consists of copper carbonate, $CuSO_4$, and lime-sulphur as the active ingredients, and a synthetic resin and asphalt emulsion dissolved in ethylene chloride as the adhesive. Other repellents effective on bark are: resin and ethyl alcohol; resin and alcohol; resin and linseed oil; resin, linseed oil, and petrol; linseed oil and copper carbonate; and Venice turpentine. A deer repellent, 'Good-Rite Z.I.P.' is the result of co-operative research between the Maine Fish and Game Department and the B.F. Goodrich Chemical Co. It consists of zinc dimethyl dithio-carbamate-cyclo-hexylamine complex, which is very unpalatable, and a special polyethylene polysulphide which has a distinctive smell. It is harmless to crops and there is evidence of its effectiveness against rabbits, mice, cattle and other animals [cf. *For. Abstr.* 11 (No. 1474)]. Methods of discouraging pigeons, sparrows and other birds from congregating on ledges and trees are also discussed.

2277. Prax, J. Dégâts provoqués par les campagnols à de jeunes plantations et moyens de dératisation utilisés. [**Damage to young plantations by field voles, and their control.**] *Rev. for. franç.* No. 6, 1949 (263–6 + 1 photo). [F.]

During the winter of 1948–49 and the following spring, much damage was done to young plantations and nursery seedbeds in the neighbourhood of Nancy by the field vole (*Microtus arvalis*). Of the conifers, the species most affected was Silver Fir, and next to that Norway Spruce. Young plants of Scots and Corsican Pine appeared to be immune. The animals first gnawed the terminal buds, then the needles, and finally, if they were small enough, the lateral branches. Contrary to what happened with broadleaved species, the bark of the stem and lignified branches was not touched. The two broadleaved species used in these plantations (Beech and *Quercus borealis*) also suffered, particularly Beech of less than 2 years. Here the voles gnawed the bark to a height of 5–6 cm. above the collar. Often the plants were bitten right through at ground level. The outbreak was successfully controlled by the use of oats mixed with zinc phosphide.

45.2. *Birds*

See also *For. Abstr.* 11 (No. 2276).

2278. Waterer, R. R. **Damage from birds.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (7).

Crows did great damage to sowings of *Pinus pinea* on sand dunes; the large seeds of this species are very attractive to crows. The smaller seed of *P. halepensis* is eaten by large flocks of finches visiting Cyprus as winter migrants. Both partridge and woodpigeon are fond of eating Pine seed and also graze off the cotyledons. These winter migrants are responsible for the regular failure of *P. nigra* seed at the higher altitudes. During winter this seed falls on the snow where it is very conspicuous and is consumed by large migratory flocks of pigeons and finches.

45.3. *Insects*

See also *For. Abstr.* 11
(Nos. 1704–10, 2172, 2269).

2279. Gryse, J. J. de. **Forestry insect control.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1017 (F–3), 1949. pp. 2.

Includes an account of the construction, fittings etc. of the entomological laboratory at Sault Ste. Marie.

2280. Künkele, T. Ist der forstliche Vogelschutz wirtschaftlich gerechtfertigt? [**Is protection of forest birds economically justified?**] *Anz. Schädlingsk.* 22 (3), 1949 (33–7). [G.]

An attempt is made to estimate the amount of forest pest control afforded by bird protection, giving figures based on work done by Henze in 1935 and Hähnle in 1936. An estimate is also made of the yearly losses by insect damage in coniferous stands particularly subject to attack (without control by insecticides and without bird protection) and these are

compared with the yearly expenditure on bird protection. The latter expenditure amounts to only one-third of the losses. Even assuming that birds cannot entirely be relied upon to prevent mass outbreaks and that other measures have to be taken, the amount of control exercised by them still makes bird protection economically worth while.

2281. FRANZ, J. Über die Zonenbildung der Insektenkalamitäten in Urwäldern. **[On the zonation of mass outbreaks of insect pests in primeval forests.]** *Repr.* from *Forstwiss. Cbl.* 67 (1), 1948 (38–48). 43 refs. [Institut für angewandte Zoologie der Forstl. Forschungsanstalt München.] [G.]

In this preliminary communication the author points out that catastrophic mass outbreaks of forest insect pests occur, so far as virgin or quasi-virgin forests are concerned, almost entirely within a relatively restricted climatic zone corresponding roughly with the more southerly portions of the northern coniferous forest, reaching the transition to deciduous forest but not advancing to the polar or to the hot/xeric limits of the coniferous forest. In tropical forest a balance is probably kept by factors such as the greater ability of the host trees to produce tissues in excess of the insects' ability to consume them, the diversity of the species composing the forests, and the efficiency of natural enemies. Factors of a like nature operate on a reduced scale in the temperate deciduous forests, and here climate tends to limit the reproductive capacity of the pests, while the hosts have a greater capacity to recover from defoliation than have the conifers. The coniferous forests, on the other hand, are relatively poor in species both of trees and insect pests, do not readily recover from damage, and though they represent a comparatively unfavourable habitat as regards climate and food, have acquired an insect population composed largely of a few specialized species which are capable of breaking out in vast numbers when circumstances are favourable. The N. limit of mass outbreaks lies far S. of the limit of the host species and appears to be determined primarily by climate. Among examples given is one from Finland, where unextracted war-time fellings, numerous fires, road-building activities etc., gave an ample supply of materials for bark-beetle outbreaks, in spite of which no large-scale outbreak developed. In this case the critical factor is believed to be the short duration of favourable conditions, which limits the generations of *Ips typographus* to one per year. At the xeric limit of coniferous forest, mass outbreaks are again probably restricted by climatic factors. The worst outbreaks appear to occur at the transition to temperate deciduous forest, especially where conifers have been established artificially beyond their natural range.

2282. VARLEY, G. C. **Population changes in German forest pests.** *J. anim. Ecol.* 18 (1), 1949 (117–22). 13 refs.

A detailed critical review of studies by Schwerdtfeger on population changes in *Panolis griseovariegata*, *Hyloicus pinastri*, *Dendrolimus pini* and *Bupalus piniarius* [*For. Abstr.* 4 (132)], all of which feed as larvae on the needles of *Pinus sylvestris*. The populations were estimated annually in December for 60 years by counting pupae or larvae in the surface soil of selected localities. Schwerdtfeger discusses the various theories which have been put forward to account for the fluctuations in population, which do not coincide for the 4 species. The writer of this review considers that the most likely hypothesis to explain the co-existence of the 4 species is that the population densities of each species are separately controlled by different factors at such low population levels that competition for food is very uncommon. The different species are to a very large extent attacked by effectively specific parasites, and there is some indirect evidence that parasites may be responsible for the fluctuations in population. The need for further data on mortality and fertility, and the importance of plotting population data on a logarithmic scale are emphasized.

2283. SCHWERDTFEGER, F. Insektizide Nebel im Forstschutz. **[Aerosols in forest pest control.]** *Anz. Schädlingsk.* 22 (1), 1949 (7–10). 13 refs. [G.]

Reviews different types of aerosol with particular reference to German experiments, and gives preliminary results of successful operations in 1947–48 in the forest district of Gartow. Aerosols produced by an evaporation or sublimation process (*Schwelnebel*) are convenient to use, since no complicated apparatus is necessary, but the process is wasteful. In the Gartow experiments 500 g. of chemical

gave a fog lasting 30 min. and with a range of 70 meters (i.e. 7 kg. per ha.) but mortality was only 30–50%. With aerosols produced by chemical reactions (*Reaktionsnebel*) about 2·5 kg. of material per ha. gave successful results. With atomizers (*Düsennebel*) results were variable. The author believes that the last 2 methods promise best, provided that suitable apparatus can be developed.

2284. THALENHORST, W. Eine neue Anwendungsform von Kontakt-Insektiziden. [**A new form of contact insecticide.**] *Anz. Schädlingsk.* 22 (5), 1949 (67–9). 5 refs. [G.]

Reviews modern methods of applying contact insecticides with special reference to the bark-beetle outbreak in Germany. In general, except with freshly applied powders, the interval between the beetle's alighting on the tree and the beginning of its tunnelling operations is too short for the usual contact insecticide to take effect. An insecticidal paint has been developed by the firm of Dr. Kurt Herbert & Co. at Wuppertal-Barmen. This preparation ('DKH-Streichmittel Sch 317') consists of an organic substance soluble in acetone and other solvents. When painted on the tree it forms a thin sticky coating, which imprisons the insect where it alights. The basic substance, 'Sch 317', is not insecticidal in itself, but can be mixed with a 666 preparation, or (presumably) with DDT. It is waterproof and stable, hardens at a low temperature, but regains its viscosity as the temperature rises again, and remains effective on the tree until the bark has dried out. Large-scale experiments with this insecticide have not yet been made, but it has been proved that species of *Ips* will settle in a normal fashion on treated trees and die, without exception, before, or shortly after, beginning to tunnel. The economic feasibility of the treatment is not yet determined and experiments are continuing.

2285. TITTLEY, E. A. Le BHC, rival du DDT. [**666, a rival of DDT.**] *Revue d'Oka* 33 (5), 1949 (199–244). 116 refs. [F.]

A detailed and comprehensive account of the chemical composition and insecticidal properties of BHC, 666, or hexachlorocyclohexane ($C_6H_6Cl_6$), with an account of experiments in its use. Amongst the insects which it controls successfully are sawflies, various aphids, psyllids and leaf rollers.

2286. CONNELL, E. A. **The 'white oils'.** *Trees, Cleveland (Ohio)* 9 (6), 1949 (16).

'White oils' are products derived from crude petroleum by processes that remove a large % of the unsaturated hydrocarbons. It is the unsaturated, or aromatic, hydrocarbons which, through oxidization, cause foliage 'burning'. Spraying operations in Ohio showed that Acme White Oil (product of Standard Oil of Indiana) when used at a rate of *ca.* 5 gal. to 40 gal. of 5% DDT emulsion, not only gave excellent control of leaf-hoppers and scolytid beetles, but also gave better than average control of mites and aphids for as long as 30 days; no foliage damage was observed. The original object of the experiments was the use of white oil to retard evaporation of the DDT emulsion; this it did to an appreciable extent.

2287. GÖTZ, B. Die Wirkung von Gesarol und anderen DDT-Präparaten auf Fische. [**The effect of Gesarol and other DDT preparations on fish.**] *Anz. Schädlingsk.* 21 (3), 1948 (39–40). [G.]

Laboratory tests clearly demonstrated the extreme toxicity of Gesarol and various other DDT preparations to bleak (*Abramis lucidus*).

2288. GOFFART, H. Die Wirkung neuartiger insektizider Mittel auf Regenwürmer. [**The effect of new types of insecticide on earthworms.**] *Anz. Schädlingsk.* 22 (5), 1949 (72–4). 1 ref. [G.]

Laboratory experiments with insecticidal powders on earthworms, indicated that a concentration strong enough to be fatal is not likely to be encountered in the field. On the other hand a 0·2% solution of a 666 preparation and a 0·001% solution of an organic phosphorus compound, E605*f*, both caused high mortality, and danger to earthworms from these solutions was confirmed by field experiments.

2289. EATON, C. B., BEAL, J. A., FURNISS, R. L., and SPEERS, C. F. **Airplane and helicopter spraying with DDT for Spruce budworm control.** *J. For.* 47 (10), 1949 (823–7).

In 1948 tests were conducted on aerial spraying with DDT to control Spruce budworm in 4,200 acres of infested forest of mixed Douglas Fir and *Abies grandis* in eastern Oregon. Excellent control was obtained with both 1 lb. DDT/1 gal. fuel oil/acre and with double that dosage. A dosage of

0·5 lb. DDT/0·5 gal./acre gave unsatisfactory control. The spray was applied during the short period in budworm development when the larvae are most vulnerable, i.e. when they are feeding on the expanding foliage. The ability of the helicopter to operate from an improvised landing area close to the operations, compensated for its limited load compared with that of an aeroplane. The spraying equipment used in this study, the method of timing the spraying, and the methods employed to determine its effect on the budworm larvae are described.

2290. EIDMANN, H. Verbreitung und Schadgebiete des Tannentriebwicklers *Cacoecia murinana* HB. (Lep. Tortricidae). [**Natural range and regions where damage by the Silver Fir tortrix occurs.**] *Anz. Schädlingsk.* 22 (7), 1949 (103–7). 30 refs. [G.] [Göttingen University.]

Describes and discusses the geographical distribution of the Silver Fir shoot tortrix (*Cacoecia murinana*) and the possibility of determining the climatic factors that limit its range. The latter problem is complicated by the fact that the spread of the monophagous *C. murinana* seems to be limited by the occurrence of its host, and the pest would probably extend its range into new regions if *Abies alba* were grown there.

2291. SCHNEIDER-ORELLI, O., and MAKSYMOV, J. Neue Ergebnisse in der Bekämpfung des Weisstannenborkenkäfers *Ips curvidens*. [**New directions for the control of Silver Fir barkbeetle, *Ips curvidens*.**] *Schweiz. Z. Forstw.* 100 (3/4), 1949 (171–8). [G.g.f.]

[For earlier reports see *For. Abstr.* 10 (No. 2971).] Only first-instar larvae are found in the bark, and these can be destroyed by timely barking of the attacked trees and immediate burning of the bark. Second-instar larvae penetrate the sapwood to a depth of several mm. and further development takes place in galleries whose exits are sealed with boredust. Barking does not affect these, and in order to prevent swarming, Firs which, when barked, show signs of penetration of the sapwood, should be sprayed with an 0·5% solution of the new chlordane emulsion called Octamul-Maag at a rate of 8 litres liquid/cu.m. wood. This treatment costs about 0·96 fr. per cu.m. When infested and weakened trees have been removed from a stand, the use of trap logs is valuable. All slash which is not burnt should be removed from the forest.

2922. FANKHAUSER, F. Die Borkenkäferschäden an den ersten Jurakette im Kanton Bern. [**Bark-beetle damage on the first chain of the Jura in the canton of Bern.**] *Schweiz. Z. Forstw.* 100 (7/8), 1949 (347–55). [G.f.]

An account of an infestation of *Ips curvidens* and the measures taken to organize a control campaign. Doubt is expressed as to the possibility of Silver Fir's maintaining itself in this region.

2293. COULON, M. DE. Composition des peuplements et dégâts du bostryche curvidenté. [**Stand composition and barkbeetle (*Ips curvidens*) damage.**] *Schweiz. Z. Forstw.* 100 (7/8), 1949 (355–60). [F.g.]

The southern slope of the first range of the Jura, which is suffering from an infestation of *Ips curvidens* in Silver Fir stands, has three natural vegetation types:—(1) on the lower slopes a *Querceto-Lithospermetum*, dominated by *Quercus pubescens* and Ash, where Silver Fir does not occur naturally. (2) Above this, as the site becomes drier, a *Querceto-Ca·pinetum calcareum et Fagetum caricetosum albae* dominated by *Quercus sessiliflora* and Beech, where Fir is not natural, or at least not in optimum conditions. (3) Above *ca.* 800 m. occurs a more or less typical *Fagetum* with good-quality Beech, mixed on the more sheltered sites with Silver Fir and *Acer pseudoplatanus*; here the Fir is in its natural habitat. When these zones were plotted on a map (scale 1 : 10,000) and superimposed on another map on which the foci of barkbeetle infestation had been plotted, it was found that the latter almost all fell within the zone of type (2). It is concluded that, in this region, the Fir ought not to be planted below 800 m.

2294. KRAEMER, G. D. Die Brutbaumdisposition bei Borkenkäferbefall. [**The predisposition of host trees to attack by barkbeetles.**] *Anz. Schädlingsk.* 22 (4), 1949 (49–51). [G.]

In order to investigate the factors that predispose a tree to attack by barkbeetles, observations were made on Fir attacked by *Pityokteines curvidens*. The state of soundness of the tree was estimated by measuring the osmotic value of living bark tissue by the cryoscopic

method. It was ascertained that *P. curvidens* attacks the trunk of Firs when the osmotic value of the bark has sunk from its normal 10–11 atm. to below 7–8 atm. *P. spinidens* and *P. vorontzowi*, which usually breed in the crown and branches of Fir, attack living bark with an osmotic value of 10 atm. The osmotic value of bark in branches usually exceeds 12 atm. It is evident that a subnormal degree of osmotic pressure in the bark precedes bark-beetle attack. Such an attack is usually the last link in a chain of mishaps by which the tree is weakened and its water economy upset. Among the most important initial causes of such a chain of events are adverse climatic influences, particularly drought, and attack by defoliating and other insects. It seems probable that *P. spinidens* and *P. vorontzowi* sometimes pave the way for *P. curvidens*.

2295. KRAEMER, G. D. Borkenkäfer an Douglasie. [**Barkbeetles on Douglas Fir.**] *Anz. Schädlingsk.* 21 (9), 1948 (133). [G.]

Brief notes on the discovery of the following barkbeetles on Douglas Fir (*Pseudotsuga taxifolia*) in the forest district of Sulzbach (Black Forest):—*Pityogenes chalcographus*, *Pityokteines curvidens*, *P. vorontzowi*, *Pityophthorus micrographus* and *Crypturgus pusillus*.

2296. FRANZ, J. Neues zur Bekämpfung des Buchdruckers, *Ips typographus* L. [**Recent investigations in the control of *Ips typographus*.**] *Anz. Schädlingsk.* 21 (1), 1948 (2–8). 10 refs. [G.g.] [Institut für angewandte Zoologie, München.]

Presents the more important results of experiments conducted in Bavaria since 1946 in controlling *Ips typographus*. Three types of operation were tested:—(1) Control, by means of sprays or dusts, of adult beetles hibernating in the ground. This proved uneconomic, about 200 kg. per ha. of dust, and about 20,000–30,000 l. per ha. of spray being necessary for adequate results. (2) Poisoning of bait trees. Here, the length of time for which the insecticide remained effective was 8–12 days shorter on trees in the open than on trees in the stand, but complete mortality was higher on trees in the open. Sprays were more effective than dusts, though dusts may be used when sprays are not available, so long as they are applied as close as possible to the flight season. A 0·5% solution of the spray *E*605*f* (Farbenfabriken Bayer, Leverkusen) gave the best results. (3) Control by attacking the feeding immature adults. Two effective methods can be used:—(*a*) Trees on which the beetles are feeding are felled, cut into 2-m. lengths and piled with brushwood, which is ignited. The insects are killed by the heat, but the wood remains unburnt and still marketable. (*b*) Trunks of felled trees are sprayed with a contact insecticide, e.g. *E*605*f*.

2297. SCHINDLER, U. Der grosse Lärchenborkenkäfer (*Ips cembrae* Heer) im Bramwald. [***I. cembrae* in the Bramwald.**] *Allg. Forstzeitschr.* 3 (23), 1948 (247–8). 5 refs. [G.]

Death of European Larch [*Larix decidua*] growing in the experimental forest of Bramwald (Oberweser district) was found to be caused by *Ips cembrae*, usually a secondary and harmless pest of this species. The infestation was confined to almost flat or sloping (100–300 m. altitude), southerly sites, where Larch was growing in mixture with Oak and Beech or with Spruce and Pine. Larch canker (*Dasyscypha willkommi*) had already attacked 50–70% of the Larch, probably as a result of the transfer to this district of unsuitable strains from the Tirol. The damage was greatest in Oak/Larch stands and it is likely that the drought of 1947 was a contributory factor in weakening the trees, this being a well known danger in mixed stands of conifers and broadleaved species. On sites suffering from drought, living Larch showed signs of attack, but the galleries were only 1–3 cm. long, and were flooded with resin, and had therefore been abandoned. Some observations on the habits of *I. cembrae* are included.

2298. JAHN, E. Das Massenauftreten des grauen Lärchenwicklers *Grapholitha* (*Semasia*) *diniana* in Österreich in den Jahren 1946 und 1947. [**The outbreak of *G. diniana* in Austria in 1946 and 1947.**] *Anz. Schädlingsk.* 21 (4), 1948 (49–51). 2 refs. [G.]

The areas affected by the Larch tortrix outbreak in Austria in 1946–47 ranged in altitude from 600 m. to 2,000 m., but altitudes of 1,600–1,900 m. were preferred. Attacks affected both pure and mixed stands, but were serious only in pure stands, or in those where Larch predominated. Stands of all ages were attacked but infestations were most severe in the older ones, i.e. 100–250 years old. Loss of needles ranged from 20 to 100%, but a loss of between 50 and 70% was commonest. During 1947

the epidemic made an advance eastwards (from W. and E. Tirol into Carinthia) and decreased in severity in the west. The earliest emergence of larvae was at the beginning of May, and the latest flight season, mid-July, but the times of emergence etc. varied with altitude. In N. Tirol parasitism amounted to *ca.* 50%, but in Carinthia and E. Tirol it was insignificant. The Larch miner moth (*Coleophora laricella*) was also found on damaged trees in association with the Larch tortrix. [Cf. *For. Abstr.* 10 (No. 742).]

2299. WATERSTON, J. M. **The pests of Juniper in Bermuda.** *Trop. Agriculture, Trin.* 26 (1/6), 1949 (5–15 + 13 photos). 42 refs.

From 1939 to 1944, the chief pests affecting *Juniperus bermudiana* foliage were aphids (*Cinara juniperi*), Juniper midge (*Contarinia juniperina*), Spruce mite (*Paratetranychus ununguis*), leafhoppers (*Ormenis infuscata*), and the black Cedar scale (*Acutaspis perseae*). These had a seasonal incidence, reaching epidemic proportions during dry weather and disappearing at the onset of heavy rain. Affected stands usually recovered when thinned and pruned. During 1945, 2 pests new to Bermuda, an oyster-shell scale, *Lepidosaphes newsteadi* and the Juniper scale, *Carulaspis visci* suddenly appeared and threatened to kill the endemic Juniper [cf. *For. Abstr.* 10 (No. 2973)]. The incidence of parasitism on *C. visci* by *Aspidiotiphagus lounsburyi* is high, but it is not known yet whether the chalcid will hold the pest in check. No effective parasites of *L. newsteadi* are known. *From author's summary.*

2300. KURIR, A. Kalamität der Nonne (*Lymantria monacha* L.) in den Alpengebieten der Nordsteiermark 1946–48. [**Disastrous outbreak of nun moth in the Alpine regions of northern Styria 1946–48.**] *Anz. Schädlingsk.* 22 (8), 1949 (113–5). 16 refs. [G.] [Institut für Forstentomologie und Forstschutz der Hochschule für Bodenkultur, Vienna.]

Reviews the nun moth outbreak in Austria [cf. *For. Abstr.* 10 (No. 2266)] and adds some further observations. In 1947 in northern Styria the older Spruce stands, which were lightly defoliated in 1946, and again in 1947, were killed, while neighbouring younger stands survived the same intensity of attack. In Alpine regions the moth appears to prefer a position half-way up the tree for oviposition, and not the first third of the tree, as at lower altitudes. Egg counts revealed that under Alpine conditions the following number of eggs per stem could be reckoned as critical for different intensities of attack:—350 eggs per stem—very light defoliation (*Naschfrass*); 350–1,500—light defoliation; 1,500–3,000—moderate defoliation; 3,000–4,000—part moderate, part complete defoliation; 4,000–23,180—complete defoliation. Laboratory investigations on eggs collected from 75 trees revealed a total of 67·1% completely sound eggs. No parasites were discovered. The mass outbreaks of the nun moth in the eastern Alps are confined to pure Spruce stands, artificially cultivated in the broadleaved and mixed forest zone.

2301. GÄBLER, H. Ergänzungen zu 'Abfaltern zur Bekämpfung der Nonne (*Lymantria monacha* L.)'. [**Additions to 'Destruction of adults in the control of the nun moth'.**] *Anz. Schädlingsk.* 22 (2), 1949 (27–9). 4 refs. [G.]

The above-mentioned work [cf. *For. Abstr.* 6 (260)] included data based on Wellenstein's and Mors's method of predicting *L. monacha* epidemics from data founded on the relationship of the size of the pupal skin to the number of eggs. In the light of further information on the change of this relationship during the course of an epidemic, some amendments have been made to the figures given. [Cf. *For. Abstr.* 8 (Nos. 2751–2).]

2302. GROSCHKE, F. Zur Lebensweise des grauen Fichtenwicklers, *Cacoecia histrionana* Froel. (Lep., Tortric.). [**The habits of *C. histrionana.***] *Anz. Schädlingsk.* 22 (5), 1949 (65–7). [G.]

Preliminary results of observations on the habits of *Cacoecia histrionana* in Bavaria, both in the laboratory and in the field, and of attempts to discover and breed parasites.

2303. MORRIS, R. F. **Frass-drop measurement in studies of the European Spruce sawfly.** *Bull. Mich. Sch. For.* No. 12, 1949. pp. 58. 37 refs.

This paper reports the results of a study concerned with the measurement of frass drop for the larvae of the European Spruce sawfly, carried out between 1939 and 1946. Sufficient

evidence was obtained to show that the method is entirely feasible for determining population trends, and is superior to any previously used, both in usefulness of the data provided and in respect of time and equipment required. Defects in certain phases of the work are pointed out and improvements suggested. Although this paper is mainly concerned with the European Spruce sawfly, the method is applicable to many other forest insect defoliators, and the data and discussion are presented with this in mind.

2304. Morris, R. F. **Differentiation by small mammal predators between sound and empty cocoons of the European Spruce sawfly.** *Canad. Ent.* 81 (5), 1949 (114–20). 8 refs. [Dominion Entomological Laboratory, Fredericton, N.B.] O.R.S.

Small mammal species differ widely in their ability to distinguish between sound cocoons of *Gilpinia hercyniae* and those that are dead or emptied by parasites. This ability is highly developed in shrews (*Sorex* and *Blarina*), moderately so in mice (*Peromyscus*) and practically lacking in the voles (*Clethrionomys*). Efficiency in selection is closely related to food habits, being most marked in the more insectivorous species. *From author's summary.*

2305. Bradley, G. A. **The yellow-headed Spruce sawfly, *Pikonema alaskensis* Roh.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Can.* 5 (5), 1949 (2–3).

Investigations were carried out in Saskatchewan in the park-belt area, where numerous farm shelterbelts containing White Spruce were heavily infested with the sawfly. The trees upon which most of the eggs had been laid had made slower growth than those which were comparatively immune (annual shoots of ½ in. compared with 1–1½ in.). Variation in rate of growth of the host tree may, therefore, influence the severity of attack by the sawfly. Diapause probably plays an important part in the re-establishment of infestation in isolated shelterbelts after effective artificial control. The individuals in diapause in the soil are unaffected by the usual control measures and are able to re-infest the trees when they emerge, the more easily so, because their natural parasites have been killed by artificial control. Repeated sprays are therefore necessary.

2306. Hubault, E. Peut-on lutter contre la processionaire du Pin? **[Is it possible to control the Pine processionary moth?]** *Rev. for. franç.* No. 7, 1949 (310–3). [F.]?

Some further data on experiments in control by glue-banding trees. [Cf. *For. Abstr.* 11 (No. 1497).]

2307. Gois, E. da Silva Reis, and Silva, F. Azevedo e. A 'processionária do pinheiro'. (Prejuízos económicos, descrição da biologia do insecto e métodos de tratamento). **[The Pine processionary moth. (Economic losses, biology of the insect and control).]** *Pinhal e Resina* 2 (6/7), 1949 (52–7, 135, 136). 6 refs. [Port.f.e.]

The Pine processionary moth (*Thaumetopoea pityocampa*) is widespread in Portugal, where it seems to show a greater preference for *Pinus sylvestris* and *P. nigra* than for *P. pinaster*. The article contains a review of known control methods and their costs, and gives the results of some experiments in Portugal with DDT oil solutions and aqueous suspensions; the latter, sprayed on nests, gave best results. Costs amounted to 71.33 escudos per ha. [Cf. *For. Abstr.* 10 (Nos. 2281–2).]

2308. Beltram, V. *Cnethocampa pityocampa* (nov način uništavanja gusjenica). **[*Cnethocampa pityocampa* (a new method of trapping its larvae).]** *Šum. List* 72 (8), 1948 (272–3). [Croat.]

On the basis of observations made in Vipava (Slovenia) it is proposed to destroy the larvae of this moth at the time they descend the Pine stems to pupate in the ground, by the following device. A sticky band is applied round the stem in elliptical fashion, the free ends funnelling down into the mouth of a small box fixed at the foot of the tree and filled with soil and gravel. The larvae are shepherded into this and can be destroyed at leisure. This method is proposed only for the bigger trees where destruction by hand is impossible.

2309. Nunberg, M. Z biologii niektórych szkodników limby (*Pinus cembra* L.). **[Aspects of the biology of some insect pests of *Pinus cembra*.]** *Sylwan* 91 (1/4), 1947 (99–108). 10 refs. [Pol.e.]

Details of the life history of the insect pests attacking *Pinus cembra* in the Carpathians. The chief of these are *Polygraphus grandiclava* and *Pissodes pini*. *P. grandiclava*, although

occurring also on fruit trees, has *P. cembra* as its chief host. It attacks the lower, live as well as dying, branches, preceded by *P. pini*. The writer considers the descriptions and drawings of the galleries made by *P. brandiclava* given by Seitner and Escherich inaccurate and unsatisfactory, and puts forward his own descriptions and drawings. There are two varieties of *P. pini* in Poland; a lowland variety which attacks the Scots Pine and a high-mountain one which attacks *P. cembra*. The latter variety is believed to have retreated into the Carpathians during the advance of the ice, and to have subsequently become separated from the lowland variety by the belt of Spruce and Silver Fir forests covering the slopes of the Carpathians. Among other pests of *P. cembra* in the Carpathians the writer mentions *Hylurgops glabratus*, *H. palliatus*, *Crypturgus pusillus*, *Cryphalus abietis*, *Dryocoetes autographus*, *Pityophthorus pityographus*, *Pityogenes bistridentatus*, *Ips cembrae* var. *engadinensis*, and *Ips amitinus*.

2310. MATHERS, W. G. **Spruce gall *Adelges*.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 5 (5), 1949 (3).

A survey was made to determine whether the DDT spray used in 1948 to control the false Hemlock looper in the Lake Windermere region of British Columbia had caused an increase in the population of *Adelges cooleyi* on the treated area. The conditions did not permit of a definite answer to the question, since the degree of destruction of 1948 foliage by the looper and the loss of foliage from needle-cast disease and winter injury, made it impractical to determine the extent of aphid injury on the area in previous years. Over 69,000 needles were examined. The average % of needles showing injury from *Adelges* was 44·5. The two sprayed plots showed 45·6 and 44·1% injury respectively, while the unsprayed plots showed 33·3 and 61·1%. These figures indicate that the spray had at all events not caused a great increase in population.

2311. SMITH, D. N. **Experimental control of *Adelges cooleyi* Gill.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 5 (5), 1949 (3–4).

Sprays containing 40% nicotine sulphate, 50% wettable DDT and 50% wettable BHC (666) respectively, were used on nursery beds of 2/0 stock heavily attacked by *Adelges cooleyi*. The nicotine was applied in dilutions of 1/500, 1/750 and 1/1,000 with the addition of a wetting agent, Tergitol, and in all cases, down to dilutions of 1/1,000 plus Tergitol 1/100, effected 100% control of exposed nymphs and of productive females and their eggs. Good results were also obtained from DDT and BHC, and in each case the addition of Tergitol provided maximum control. Tergitol appears to be instrumental in bringing suspended insecticides into closer contact with pests protected by repellent materials (e.g. silken skeins). The dilution of 1/100 is optimum and there is a marked reduction in efficacy at 1/500. Tergitol itself possesses insecticidal properties. A marked growth response appeared 6 weeks after application of the sprays containing nicotine sulphate and Tergitol. Nicotine sulphate and soap flakes, or Tergitol alone, did not produce it, and increased penetration of the needle tissue by the nicotine sulphate, promoted by the wetting properties of Tergitol, is a likely explanation of this effect. Nicotine sulphate has previously been reported as having growth-stimulating properties.

2312. MARIN H., C. Plaga de las Acacias. **[Pest of Acacias.]** *Agric. trop., Bogotá* 5 (8), 1949 (43–6). [Span.] A.P.B.

A brief description of *Icerya purchasi*, an imported pest of ornamental Acacias in Bogotá, with notes on the introduction of the parasite *Rodolia* from California. Studies on other parasites are being conducted at the 'Francisco José de Caldas' Agricultural Experiment Station. [Cf. *For. Abstr.* 7 (No. 1691).]

2313. LEEUWEN, E. R. VAN. **The use of DDT for the control of Chestnut weevils.** *J. econ. Ent.* 42 (5), 1949 (825–8). 1 ref. [U.S.D.A. Bureau of Entomology and Plant Quarantine.]

Describes tests with DDT against Chestnut weevils (*Curculio auriger* and *C. proboscideus*) which have attacked blight-resistant Chestnuts of Asiatic origin, distributed by the U.S. Department of Agriculture for experimental planting in orchards and forests. Oviposition extends over a period of several weeks, during which time nuts must be protected. A satisfactory spray was obtained by mixing kaolin type 41 with equal parts by weight of DDT. Three applications of this mixture at the rate of 4 lb./100 gal. water gave a high degree of control.

2314. NEVES, C. M. BAETA. Introdução ao estudo da 'biocenose' do sobreiro (*Quercus suber* L.). **[Introduction to the study of the biocoenosis of *Q. suber* L.].** *Bol. Junta nac. Cortiça, Lisboa* 9 (102), 1947 (277–80, XLVII). [Port.e.]

A brief survey of insects associated with *Q. suber*.

2315. NEVES, C. M. BAETA. Contribuição para o conhecimento da entomofauna do sobreiro (*Quercus suber* L.). **[Contribution to the knowledge of insects associated with *Q. suber*.]** *Bol. Junta nac. Cortiça, Lisboa* 10 (117), 1948 (444–7, LXXVI). [Port.e.]

Describes the discovery for the first time in Portugal of *Lichenophanes numida* on *Quercus suber* which had already been attacked by *Nummularia regia*. This discovery extends the known distribution of the insect considerably to the west. Short accounts are also given of the discovery of *Reticulitermes lucifugus* for the first time on *Q. suber* and of *Myzocallis castanicola* also on *Q. suber* and found for the first time in Portugal.

2316. A largarta do sobreiro (*Lymantria dispar* L.). Meios de combate—soluções oleosas de D.D.T. Instruções para o emprego das soluções oleosas de D.D.T. **[Gypsy moth. Control measures—DDT oil solutions. Instructions for the use of DDT oil solutions.]** *Bol. Junta nac. Cortiça, Lisboa* 10 (115), 1948 (336–7, L.) [Port.e.]

Some practical recommendations based on the experience of the Commission for control of this moth on *Quercus suber* in Portugal.

2317. GÓIS, E. DA S. REIS. Insectos depredadores e parasitas da Limantria. **[Insect predators and parasites of *Lymantria dispar*.]** *Bol. Junta nac. Cortiça, Lisboa* 11 (130–131), 1949 (479–83, LXXXIV; 537–40). 9 refs. [Port.e.]

These are described, with brief notes on their use in combating infestations.

2318. FRANSEN, J. J. De bestrijding van de plakker (*Lymantria dispar* L.). **[Control of the gypsy moth.]** *Versl. landbouwk. Onderzoek., 's-Grav.* No. 54.12, 1949. pp. 23. [Du.e.]

Laboratory experiments were made on the susceptibility of gypsy-moth larvae to different insecticides. (1) Young larvae were only slightly affected by derris dusts; (2) their susceptibility to pyrethrum powders is slight, but increases with the age of the larvae; (3) their susceptibility to DNC [dinitro-cresol] is slight, but it is possible that larvae in plantations could be controlled by DNC; (4) 666 is ineffective; (5) DDT is effective against young larvae even in small concentrations, and older larvae might be economically controlled by it, were it available at a fair price; (6) phenothiazine insecticides are ineffective against older larvae, and it is not yet known if they are effective against younger ones; (7) Verindal, a commercial product containing rotenone, could, if available, be successfully used against young larvae, but it is not yet known whether its use would be economically possible; and (8) the results from 2 commercial preparations containing pyrethrum were no more satisfactory than those from pyrethrum dust with a carrier base at the same concentrations. Quantities given in the tabulated results are only of value as a guide to future investigators, since the susceptibility of the larvae to different insecticides varies considerably with age; further field experiments are recommended.

2319. FRANSEN, J. J. De bestrijding van de ringelrups. **[The control of *Malacosoma neustria*.]** *Versl. landbouwk. Onderzoek., 's-Grav.* No. 54.13, 1949. pp. 16. 5 refs. [Du.e.]

Of the insecticides tested under laboratory conditions (derris powders, sulphanilamide, phenothiazine, Verindal, dinitro-*o*-cresol powders, DDT and pyrethrin), only DDT and pyrethrin can effectively be used against the larvae of *Malacosoma neustria*.

2320. SURANYI, P. Ein neuer Schädling in Europa. (*Hyphantria cunea* (Drury).) **[*H. cunea*, a new pest in Europe.]** *Pflanzenschutzberichte, Vienna* 2 (3/4), 1948 (33–42). [G.g.] [Universität für Agrarwissenschaften, Budapest.] I.I.E.

Describes the spread of *H. cunea* in Hungary [cf. *For. Abstr.* 10 (No. 756)], its life history and habits. Among control measures are recommended spraying with $CaAsO_4$ (0·75–1%) or with DDT solutions (2–3%), or deep digging of the soil in infested areas in late autumn and early spring, along with burning of the fallen foliage and clearing the trees of pupae.

2321. WELLINGTON, W. G., HENSON, W. R., and SULLIVAN, C. R. **Investigations in**

physical ecology. *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 5 (5), 1949 (2).

Investigations were made of the effects of physical factors upon the behaviour and activity of tent-forming colonial forest insects, using the fall webworm [*Hyphantria* sp.] as test species. In the field, temperatures within the colonial webs ranged as high as 40° C. in full sunlight when the outside air temperatures were 26–27°. Leaf temperatures inside the tent were found to rise as high as 7·5° above those of outside leaves in full sunlight and 4° above those of outside leaves under cloud. When web temperatures rise much above 30° C. larvae of instars 4 and 5 move out to the surface and on to neighbouring twigs; if the temperature in the large web drops below 30°, larvae re-enter it. Laboratory tests of the reactions to light of instars 2–6, have shown that, at ordinary temperatures, normal larvae are indifferent to light or, at most, are weakly photopositive. Field observations indicate that more feeding occurs during warm, moist nights or during humid, overcast days with little air movement, than on clear, dry days. [Cf. *For. Abstr.* 11 (No. 1486).]

2322. Duffy, E. A. J. **Recent research on long-horned timber beetles.** *Brit. Sci. News* 3 (25), 1949 (19–21). 3 refs.

The author has succeeded in breeding and making detailed observations on nearly all the British species, numbering about 60. Attention was drawn to the marked polyphagy exhibited by larvae of certain of these. Breeding experiments clearly indicated that the successful development of wood-boring larvae depends to a far greater extent on the nature and condition of the wood (i.e. thickness of bark, presence of sap, moisture content etc.) than on the species of tree concerned. Many larvae show a decided preference for a particular part of the tree, such as the roots, twigs, or seed pods. In general, dead-wood feeders are far less discriminating than are the species that mine living wood, this is well exemplified by the dry-wood borer *Stromatium barbatum* F., which is known to have over 300 hosts. Notes are given on the following species which occur in imported wood:—*Hylotrupes bajulus*, *Stromatium barbatum*, *Prionus coriarius*, *Eburia quadrigeminata*, *Acanthocinus aedilis*, and *Plocaederus viridipennis*.

2323. Thiem, H. Zur Weiterentwicklung der praktischen Maikäferbekämpfung. **[Further developments in practical cockchafer control.]** *Anz. Schädlingsk.* 21 (2), 1948 (17–21). 5 refs. [G.g.] [Institut für Obstund Gemüsebau der Biologischen Zentralanstalt in Heidelberg/Wiesloch.]

Gives, and discusses the results of, laboratory tests with various insecticidal sprays and dusts (including both contact and stomach poisons) on *Melolontha melolontha*. The superiority of 666 and ester preparations over DDT preparations was marked. Field experiments confirmed the laboratory results.

2324. Thiem, H. Zur Weiterentwicklung der praktischen Maikäfer- und Engerlingsbekämpfung. **[Developments in the practical control of *Melolontha melolontha* and its larvae.]** *Anz. Schädlingsk.* 21 (4), 1948 (51–5). [G.g.]

Laboratory and field tests proved the suitability of ester and 666 preparations for control of cockchafer larvae. Surface applications of dusts failed, but insecticide thoroughly mixed with soil retained its properties for several weeks and gave good protection. Moderate watering of plants with high concentrations of insecticide was more successful than liberal watering with low concentrations. For good results, all underground parts of the plant and the adjoining soil must be reached.

46. DAMAGE BY MAN

2325. **Logging damage in the Spruce-Balsam type of the Upper Fraser.** *Rep. B.C. For. Serv. 1948*, 1949 (19–20).

A study was made to estimate the damage caused to the residual stand by the use of tractors and the practice of skidding tree-length logs. A table gives comparative damage for 5 methods of logging:—(1) 16-ft. logs with horses in summer, (2) 32-ft. logs with tractor and skidding pan in summer, (3) ditto in winter, (4) as (2) but skidding tree-length logs, (5) as (4) but without pan. The mean destruction % was (1) 29·4, (2) 44·2, (3) 21·0, (4) 59·4, and (5) *ca.* 90. The greater destruction caused by heavy tractors skidding long logs up to tree lengths, apparently reduces the advance growth below the minimum requirements for stand regeneration. It appears desirable, on the basis of this information, to restrict summer logging

by tree lengths to ground conditions which demand special consideration.

47: INJURIES OF ALL KINDS TO INDIVIDUAL TREE SPECIES

See also *For. Abstr.* 11 (Nos. 1660, 1712, 1785).

2326. CAMPBELL, W. A. **Relative abundance of *Phytophthora cinnamomi* in the root zones of healthy and little-leaf-diseased Shortleaf Pine.** *Phytopathology* 39 (9), 1949 (752–3). 3 refs.

The data obtained in this study demonstrate that *P. cinnamomi* is present to a limited extent in the soil round healthy trees in stands that are free of little-leaf, but that it is much more abundant in the root zone of diseased trees.

2327. DUNLAP, A. A., and HARRISON, A. L. **Dying of Live Oaks in Texas.** *Phytopathology* 39 (9), 1949 (715–7).

Live Oaks [*Quercus virginiana*] have been observed to die more or less suddenly under a variety of site and climatic conditions in central Texas. No causal agency has been found. Severe pruning of the main branches, at first appearance of symptoms, has apparently resulted in recovery and continued health of the trees in many instances. [Cf. *For. Abstr.* 11 (No. 1509).]

5. MENSURATION. INCREMENT. YIELD

2328. HUFNAGL, H., and PUZYR, H. Grundbegriffe aus forstlicher Messkunde, mit besonderer Berücksichtigung des Feldmessens. **[The foundations of forest mensuration, with special reference to surveying.]** Georg Fromme & Co., Vienna. 1949. pp. 198. [G.] Price [8*s.*]

An up-to-date manual for small forest owners, rangers, etc.

52. MEASUREMENT OF TREES AND TIMBER

52.1. *Diameter*

2329. HARTMAN, F. J. **Rapid form class diameter measurements.** *J. For.* 47 (11), 1949 (915).

A short description of an experimental model of an instrument for rapidly determining the form-class diameter measurement at the top of the first 16-ft. log of a standing tree. It consists of two separate optical systems, each using the principle of stadia to obtain the two critical measurements of the form class. In use, a constant distance of 25 ft. is measured from the base of the tree. At this distance, the two cross-hairs of the right optical system indicate the 17·5 ft. measurement from ground level. The other optical system (using some magnification) employs a scale, standard in many military binoculars, to measure the stem diameter at 17·5 ft. above the base of the tree. Measurements thus obtained may not be so accurate as those taken by pole calipers or pole tapes, but many more measurements may be taken in a day, the equipment weighs practically nothing and occupies very little space, and measurements so gathered lend themselves readily to statistical treatment and analysis.

52.4. *Measurement of Volume*

See also *For. Abstr.* 11 (Nos. 2368 *et seq.*).

2330. **Form - class volume tables.** Dominion Forest Service, Ottawa. 2nd ed., 1948. pp. 261.

This revision of the tables first published in 1930 includes 4 main types of table, based on diameter, total height and form class:—(1) total volume in cu. ft., (2) merchantable volume in cu. ft. (3) bd. ft. volumes for various log rules and (4) merchantable volume in cords. Standard volume tables (total and merchantable cu. ft. and bd. ft. by log rules) have been added for the main hardwoods and also miscellaneous tables, based in some cases on U.S.A. data.

2331. **Volume tables.** *Rep. B.C. For. Serv. 1948*, 1949 (11–7).

Site-class volume tables for Douglas Fir, Western Hemlock, Western Red Cedar, Coast Balsam Fir, and Sitka Spruce, in British Columbia.

2332. FERGUSON, J. H. A. Stamtafels voor *Agathis borneënsis* te Sampit (Borneo). **[Volume tables for *Agathis borneënsis* from**

Sampit (Borneo).] *Tectona* 39 (2), 1949 (121–34). 3 refs. [Du.E.]

Includes a detailed account of the methods used in constructing the tables.

2333. HORNIBROOK, E. M. **Merchantable height volume table for White Fir (*Abies concolor*).** *Res. Notes Rocky Mt. For. Range Exp. Sta.* No. 6, 1949. pp. 2.

2334. HORNIBROOK, E. M. **Cubic-foot volume table for Lodgepole Pine [*Pinus contorta* var. *latifolia*].** *Res. Notes Rocky Mt. For. Range Exp. Sta.* No. 4, 1948. pp. 3.

2335. ROSS, J. K. **The preparation of a volume table for *Tarrietia utilis*.** *Emp. For. Rev.* 28 (3), 1949 (271–6).

The preparation of a merchantable-volume table for *T. utilis* is described in detail: From 330 trees felled in the Kambui Reserve, Sierra Leone, over-bark girths above buttress, over-bark mid-girths of logs, and total log length were obtained. These data were arranged in 1-ft. girth classes and 10-ft. height classes, and the class means were plotted in a series of harmonized curves. A tabular statement was prepared from the final graph, and, when checked against the first 100 sample trees, gave an aggregate volume which was 1·4% less than the true total. *From author's summary.*

2336. BITTERLICH, W. Optische Zählmessung in der Bestandesaufnahme. **[Optical enumeration by the *Winkelzahl* method.]** *Jahrbuch, Hochschule für Bodenkultur in Wien, 1948*, 2, 1949 (226–32). 3 refs. [G.]

(1) In the *Winkelzahl* ('angle factor') method [cf. *For. Abstr.* 10 (Nos. 2314–6)] the unit is a *Winkelzahl* (W) corresponding to the ratio d (d.b.h., in cm.)/a (distance from observer, in m.) = 1/1. The error due to the fact that the apparent diameter is a little less than the actual, is negligible, amounting for a stem of 100 cm. diameter to only 0·2 and 0·05 mm. respectively for $W = 4$ and $W = 2$. If d and a are reckoned in the same units (e.g. cm.), a is always $\frac{100}{W}$.

When, in a stand of trees uniform in d but arranged in any manner, we select any *limiting Winkelzahl* value, W_g and take sightings all round on trees satisfying this value, we describe a circle of radius $\frac{100}{W_g} \cdot d$, and all trees for which $d > W_g$ will lie within this circle. Now the basal area of the trees within the circle will be related to its own area as

$$\left(\frac{d}{2}\right)^2 \Big/ \left(\frac{100}{W_g} \cdot d\right)^2$$

or more simply as $1/10{,}000 \left(\frac{2}{W_g}\right)^2$, where d is eliminated. If $W_g = 2$, each tree counted within the circle will have a basal area $\frac{1}{10{,}000}$ that of the circle itself, i.e. will correspond to a b.a. of 1 sq. m./ha. On level ground, b.a./ha. $= \left(\frac{W_g}{2}\right)^2 \times$ number of trees in circle.

As d has been eliminated from this fundamental equation, the latter is valid not only for the case of a stand of uniform tree diameter but also for any mixture of d.b.h. values occurring in the forest. It must always be remembered in practice that the radius of the sample area is proportional to the d.b.h. values (see above). The coefficient $\left(\frac{W_g}{2}\right)^2$, or *Zählfaktor* ('count factor'), enables the appropriate multiplier to be found for calculating b.a./ha. from number of trees, for any value of W_g.

(2) Three types of measuring instruments are briefly discussed: (*a*) a telescope with a graduated scale, which is very accurate but suffers from the disadvantages of a small field. (*b*) Special spectacles with a measuring scale. (*c*) A simple sighting device on the same lines as that described in previous papers, using a measuring blade that gives 4 readings, corresponding to $W = 2{\cdot}83$, 2·00, 1·41 and 1·00 when mounted on a 1-m. stick, or $W =$ 4·00, 2·83, 2·00 and 1·41 on a 70·7-cm. stick. Accuracy with this instrument depends largely on good vision and a steady hand, together with some practice in distinguishing the point at which personal errors of observation begin to occur. It is recommended that, for safety, one-half of the 'borderline' readings should be counted in and one-half neglected. Any of these instruments should be tested before use against a line of known length at a known distance.

(3) As regards accuracy, the method is claimed to give results as good as those of stem-by-stem calipering within the radius of the sample, provided that the instrument used is not faulty and that too many 'borderline' readings are not found. 'Overlapping' of

stems in dense stands can usually be avoided by stepping momentarily aside to take a reading or by reducing the radius of the sample, which has its own justification in dense stands. 'Borderline' readings are most frequent when using the special spectacles or simple sighting devices. They depend on the limits of sharp vision and represent an unavoidable observer's error, the magnitude of which is shown to be doubled in the subsequent calculation of b.a./ha. A theoretical example is given, said to agree well with results with the simple sighting stick in practice, in which—assuming that a 'normal' vision has an error of $\pm$ 0·4 mm. for readings of a scale on a 1-m. stick—the resulting errors for the 2·83, 2·00, 1·41 and 1·00 cm. scales are given respectively as ($\pm$) 1·41, 2·00, 2·83 and 4·00%.

Better readings can clearly be obtained by using the longer scales (wider angles), but this inevitably involves a corresponding reduction in the size of the circular sample area, and the more irregular the stand, the more important is it to use as large a sample area as possible. An actual test in a demarcated, 0·5-ha. sample plot in a very irregular stand, showed that an almost perfect reciprocal relation existed between % errors of stand representation associated with the individual W_g values used and the observer's errors for the same values. The intersection of the two error curves lay between $W_g = 1{\cdot}41$ and $W_g = 2{\cdot}00$; in this region the two errors were equal, amounting to $\pm$ 5%, and this W_g value would therefore give the greatest accuracy. As a practical guide: (i) If the W_g is increased to reduce the observer's error, accuracy may be maintained by increasing the number of sample areas. (ii) In difficult country where it is impracticable to increase the number of samples, it is better to increase their radius. (iii) Errors of stand representation may be reduced further by field notes estimating the relation of the condition of the unmeasured to that of the measured portions.

2337. BITTERLICH, W. Das Relaskop. **[The 'relascope'.]** *Allg. Forst- u. Holzwirts. Ztg.* 60 (5/6), 1949 (41–2). 3 refs. [G.]

This name is given by Bitterlich to an instrument head which he has designed (but which is not yet in production); when fitted on to a suitable stick, it forms a multi-purpose instrument for: (*a*) *Winkelzahl* observations, with automatic correction for slope [cf. *For. Abstr.* 10 (Nos. 2314–6)]; (*b*) finding Pressler's '*Richthöhe*' (distance from b.h. to the diam. which is $\frac{1}{2}$ d.b.h.); and (*c*) form height and form coefficient.

The essential features of the device (which is illustrated) are as follows:—A plummet carries at its fulcrum a cog engaging at right angles with a second, similar, horizontal cog. The latter carries two vertical split pins, which pass through holes in a horizontal, detachable frame forming two opposite quadrants, on the arcs of which are graduated scales reading off against a pointer on the fixed head. Into the split pins the *Winkelzahl* measuring blade fits; this serves to hold the quadrant frame flat against the horizontal cog, and is itself held in position by two round-nosed set screws in the split-pin arms that click into suitable holes in the blade. The blade is readily removed when it is necessary to detach the quadrant frame and change from one scale to the other. Both scales could be fitted to a single quadrant, but the balance would then be impaired.

Now:—(*a*) For checking the trees that satisfy a required *Winkelzahl*, the instrument is manipulated like the stick hitherto used, with the advantage that on a slope the pendulum twists the measuring blade obliquely to the line of sight, so that its apparent length is reduced by the cosine of the vertical angle of observation, i.e. an automatic correction is made for the increase due to gradient in the distance between observer and tree. The stick used is 70 cm. long, giving a distance of 70·7 cm. from the observer's eye to the axis of rotation of the quadrants and measuring blade. The blade has a width of 20 mm., with two square projections giving spans of 14·1 and 10 mm. respectively between their outer and inner corners. Using these 3 scale lengths, the corresponding multipliers for obtaining basal area per ha. are 2, 1 and $\frac{1}{2}$.

(*b*) To find the point where diam. = $\frac{1}{2}$ d.b.h., the observer stands at such a distance that the 20 mm. scale exactly matches d.b.h., and follows the stem upwards until its apparent diam. exactly matches the 10 mm. scale.

(*c*) The quadrants form a special kind of hypsometer using the same similar triangles as Faustmann's mirror hypsometer, but giving modified readings on the arc scales. Distance from the tree is fixed optically by the observer's standing as in (*b*), when the distance is d.b.h.

×35·35. Tree volume as given by Pressler's *Richthöhe* (R) is $\frac{2}{3}g\ (R + \frac{m}{2})$, where g = basal area and m = breast height. Now $\frac{2}{3}(R + \frac{m}{2})$ corresponds to the form height *h.f.*, and $\frac{h.f}{d}$ is obtainable, using a suitable scale on one of the quadrant arcs, as the difference between l_1—the reading to the point where diam. = ½ d.b.h., and l_2—the reading to the (estimated) point $\frac{m}{2}$. Multiplying by d then gives form height. The second quadrant scale is graduated to give values multiplied by $\frac{\pi}{4}$, so that the form coefficient $K = \frac{\pi}{4} \cdot \frac{h.f.}{d}$ [cf. *For. Abstr.* 10 (No. 2333)] is obtained directly as $l_1 - l_2$, and has only to be multiplied by d^3 to get the stem volume. Such measurements of form height and form coefficient should be especially useful in the mountains, where large errors arise when using ordinary volume tables, owing to wide variation in stem form.

Final appraisal of the practical utility of the instrument must wait until it has been manufactured and fairly widely used.

2338. HUMMEL, F. C. **The methods employed in the national forest survey of Great Britain 1947–49.** *Proc. World For. Congr.* No. 1, 1949 (39–52). [E.f.]

The forest survey is both a survey and a census of the forests of Great Britain. The position of all woods of more than 5 acres is determined and they are classified according to forest type (i.e. high forest, coppice with standards, scrub, devastated etc.), age class, species, tree form, and suitability for economic management. Forest areas are plotted on Ordnance Survey 6-in. maps (= 1 : 10,560), and the data for each stand are entered in the field on a specially designed form (illustrated) on which they are numerically coded for subsequent transfer to punched cards and mechanical tabulation (illustrated) by the Hollerith system. The second stage of the work is to provide estimates of volume for each major region, based on sample enumerations. The sampling units are $\frac{1}{10}$-acre (= 0·04 ha.) circular plots, one to every 200 acres of forest. The stands to be sampled (excluding those classified as coppice, felled, devastated and lost to forestry and all 1-10 year stands) are selected from that Hollerith tabulation in which stands are grouped according to species and age class, by a method which ensures an effective random sample. Volumes of sample plots are calculated in the field from volume tables, the enumeration data for each species being recorded separately for transfer to punched cards for subsequent tabulation and computation by Hollerith. Rate of volume increment is calculated roughly from yield tables.

2339. GUILLEBAUD, W. H. **Methods employed in the national forest survey of Great Britain 1947–49.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (13–4).

2340. ILVESSALO, Y. **Forest surveying by ground survey.** *Proc. World For. Congr.* No. 1, 1949 (61–8).

A brief account of the methods to be employed in the Finnish National Survey III, based on experience in previous surveys.

2341. HAGBERG, E. **Forest surveys.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (26–7).

Discusses the choice of topographical units and the method of recording data, for forest surveys in Sweden.

2342. LANGSÆTER, A. **Forest surveys of Norway.** *Unasylva* 3 (3), 1949 (106–12).

An account of the 1st and 2nd National Strip Surveys of Norway and the methods used, with comparison of some of the data.

2343. CRAFTS, E. C. **Co-ordination of forest survey data for large areas.** *Proc. World For. Congr.* No. 1, 1949 (80–4). [E.f.]

Reviews the principal problems encountered in co-ordinating forest survey data for large areas and methods used in the U.S.A. to foster co-ordination.

53. SOLID CONTENTS OF STACKED MATERIALS

2344. STACH, W. Die Schichtholzvermessung. **[The measurement of stacked wood.]** *Schweiz. Z. Forstw.* 100 (5), 1949 (209–29). [G.f.]

The author seeks to prove that it is unnecessary to use a large number of different

factors for calculating the volume of stacked timber, and recommends, at least for coniferous species, the employment of a single factor, either $0{\cdot}785 = \frac{\pi}{4}$ (the volume of a stacked cubic meter in which all the logs are cylinders of the same diameter, stacked one above the other in a square formation), or 0·8, a factor already in use, for squared as well as round timber.

56. INCREMENT

See also *For. Abstr.* 11 (Nos. 1590, 1820, 2361).

2345. VANSELOW, K. Einführung in die forstliche Zuwachs- und Ertragslehre. **[Introduction to the science of forest increment and yield.]** Verlag Hermann Kayser, Kaiserlautern (obtainable through J. D. Sauerländers Verlag, Frankfurt/M.I.). 3rd ed. (rev.), 1948. pp. 156. 9 pp. of refs. [G.] Price DM 8.80 [17*s.* 6*d.*]

2346. BURGER, H. Rapports entre la quantité des aiguilles et l'accroissement chez des épicéas de la forêt jardinée, dans diverses stations. **[Relations between the quantity of foliage and increment in Norway Spruce from selection forest in different stations.]** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (19–20). [F.]

A comparison was made between trees grown at Biglenwald and at St. Moritz at elevations of 900 m. and 1,800 m. respectively. At Biglenwald, 2,300 kg. of needles were required on an average to produce 1 cu.m. of stem wood, while at St. Moritz the requirement was 6,800 kg. At Biglenwald, however, completely dominated trees need 6,200 kg. of needles, or nearly three times as many as the codominants, to produce 1 cu.m. [Cf. *For. Abstr.* 10 (No. 1479).]

2347. LYON, C. J. **Secondary growth of White Pine in bog and upland.** *Ecology* 30 (4), 1949 (549–52). 7 refs.

White Pine [*Pinus strobus*] growing in New Hampshire in a bog subject to rise and fall of water level in response to local rainfall and temperature, were found to show, during the years of unsuppressed growth, essentially the same sequences of narrow and wide rings as trees growing on neighbouring upland soil. The cause of the agreement seems to be the shallow root systems of dominant bog forest trees, which result in a shortage of water for them when the water table falls during the growing season. When the White Pine is young and subject to suppression by older trees, the rate of its secondary growth shows a negative correlation with that of upland Pine, as though its root endings then penetrated more deeply into the bog water. *From author's summary.*

2348. **The effect of bark growth in determining periodic growth of individual trees.** *Rep. Nth. Rocky Mt. For. Range Exp. Sta. 1948*, 1949 (10).

An analysis of forest-survey bark measurements showed that bark increment is a significant factor in volume growth estimates. For example, a Ponderosa Pine tree 16 in. in d.b.h. outside bark which had added 6 in. of solid wood to its diameter in the previous 30 years, would have had a diameter of 9·5 in. at the beginning of the 30-year period, because the bark grew 0·25 in. during the same time. Neglect to take this into account would result in a 5% error in volume estimate.

2349. **[Use of the dial indicator to measure radial growth after different thinning treatments.]** *Rep. B.C. For. Serv. 1948*, 1949 (23–4 + 2 photos).

The dial indicator, adapted for measurement of tree growth, has been used to measure and compare responses after thinning [cf. *For. Abstr.* 10 (Nos. 1053, 1056)]. Two Douglas Firs of the same age and each 7 in. in d.b.h. were used to compare growth in the open and in a stand. For the 12 months from October 1947, the tree with unlimited growing space added 0·244 in. radial growth, while the stand tree added 0·154 in. The curves of growth showed no divergence until April 29, then the open-growing tree increased more rapidly, and continued to increase to mid-September, about 3 weeks longer than the tree in the stand. During this period, both trees were subject to daily fluctuations of similar pattern, and long-period deviations from trend which were not concurrent.

Three phases of thinning are being studied by this method:—(1) the amount and period of response compared for different treatments, (2) the effect of excessive exposure on trees of intermediate crown-class, and (3) the responses to thinning during the growing season compared with similar treatment during the dormant

period. Phase (1) is being studied on crown and low thinnings made in July 1947. Crown-thinned plots made 30% more growth during the following year than low-thinned plots. Phase (2) is a study of intermediate crown-class trees that would normally have been removed in a heavy thinning, but were left to protect natural gaps in the stand. One such tree left in a gap appeared to suffer depression in growth, but two similar trees released from dominant Alders, and thereby exposed to full light, grew faster, but not more so than the stand left after normal low thinning. Phase (3) is still in its early stages; thinnings were made in June and November 1948 and another was planned for March 1949. The immediate effect of crown thinning was very noticeable after these cuttings. In July, the summer-thinned stand grew more than twice as fast as the untreated stand and maintained a relatively faster pace to the end of September when diameter growth finished. Average radial growth for the year was 0·085 in. in the untreated part of the plot, and 0·142 in. in the part thinned in June.

2350. LØVENGREEN, J. A. **Dependence of volume increment upon thinning grade and variations of the latter.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (23–4).

A table, derived from smoothed curves, shows for Beech of site quality II (height 28 m. at 100 years) the dependence of basal-area increment on basal area midway between thinnings.

2351. HERMAN, F. R. **Growth of Aspen following partial cutting.** *Res. Notes Sth-west. For. Range Exp. Sta.* No. 117, 1949. pp. 3.

Data on growth of *Populus tremuloides* in Arizona following partial cutting.

2352. FEDERICO, S. **Research on the wood growing rate of Chestnut trees.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (21–2).

Measurements were made in 2 types of Chestnut stand, (1) with a density of 50 or more trees per ha., and (2) with a density below 50/ha. It was found that stands of type (1) had an average volume of 48·653 cu.m. and average density of 74 per ha., the comparable figures for type (2) being 34·425 and 34. Respective m.a.i. was 1·189 cu.m./ha. and 0·545 cu.m./ha. [Cf. *For. Abstr.* 11 (No. 2354).]

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

See also *For. Abstr.* 11 (Nos. 1716, 1735, 2345, 2380, 2391).

2353. WOBST, A. Aufbau und Leistung von naturnahen Wäldern. **[Structure and yield of quasi-virgin forests.]** *Forstarchiv* 20 (1/2), 1944 (29–33). [G.]

Contests the conclusions reached by Heger [see *For. Abstr.* 6 (200); 7 (No. 2116)] on the increment of unmanaged alpine forest in the Beskid Mts., and emphasizes the extreme difficulty of making valid comparisons between the yield of such forests and that of managed forest as summarized in yield tables. [Cf. also *For. Abstr.* 7 (No. 2109).]

2354. FEDERICO, S. Studi sulla produzione legnosa dei castagneti da frutto. **[The timber yield of Chestnut stands grown for fruit.]** *Ital. for. mont.* 4 (5), 1949 (267–98 + map). [It.]

Data on stocking, increment, and yield are given in detail for some 2,000 ha. of Chestnut stands in the province of Bergamo. The resulting figures for mean annual increment are compared with those in the cadastral survey of 1929, which are those normally available. In view of the importance of a knowledge of current annual increment for assessing the maturity of a stand and its susceptibility to disease, there is urgent need of more such studies. [Cf. *For. Abstr.* 11 (No. 2352).]

2355. BORNEBUSCH, C. H. Egeprøveflader i Nordsjælland. **[Oak sample plots in N. Sjælland.]** *Forst. Forsøgsv. Danm.* 19 (3), 1948 (205–52). 6 refs. as footnotes. [Dan.f.]

Describes, and gives data from repeated measurements of, 13 sample plots in Oak [*Quercus robur* s.l.] laid out in 1893–95 and subjected to heavy Danish thinnings, mostly on a 5-year cycle. Results are shown in tables and graphs, the captions etc. of which are translated in the French summary. Data are also included, from single measurements in 1945–47, on the increment of underwood species (chiefly Hazel, Sycamore Maple and Beech) on some of the plots.

2356. THOMSON, C. C. **Reduced yield in a dense Balsam Fir stand.** *Silv. Leafl. For. Serv. Can.* No. 32, 1949. pp. 2.

Measurements taken in a 60-year-old Balsam Fir stand at the Acadia Forest Experiment Station in New Brunswick illustrate the reduction in yield due to over-stocking. The stand followed a fire, and density of stocking varied with distance from seed source. Two 4-milacre plots were measured in the densest portion and two $\frac{1}{10}$th-acre plots in the more open part. Results showed that the yield of merchantable volume in the more open portion was more than double that in the very dense portion of the stand. Moreover, it is doubtful whether any of the merchantable volume in the dense stand could be harvested at a profit. All of it is contained in 4- and 5-in. trees, which make up numerically only about a quarter of the trees in the stand. Most of the merchantable volume in the more open stand is contained in trees of the 6- to 10-in. diameter classes; only about 6% of it is in trees below the 6-in. class.

2357. SÖDERSTRÖM, G. V. Två främmande trädslag vid Bispgårdens skogsskola. [**Two exotic tree species at Bispgården Forestry School.**] *Norrlands SkogsvFörb. Tidskr.* 1948 (3), (291–300). [Sw.]

Describes and tabulates mensurational data for two sample plots at this station in Jämtland (63° N., 140 m. above sea level), in: (1) *Pinus cembra* planted in 1911 as 3/2 ball plants at 1·5 × 1·5 m. spacing. At 41 years of age (from seed) this stand had produced a total of 344 cu.m., or 8·4 cu.m./ha./year. After thinning, at this time, it had 227 cu.m./ha. in 1,560 stems of mean diam. 15·7 cm., mean height 12·9 m., and mean form quotient 0·69. Timber quality, however, was scarcely high enough to encourage any large-scale planting of this species. (2) *Larix sibirica* raised from seed in 1892 and probably planted at 1·5 × 1·5 m., though no details on the planting are available. This was later underplanted with *Abies alba* raised from seed in 1913. The Larch had been thinned 4 times between 1912 and 1926, and then not until 1947, while the Silver Fir was unthinned until 1947. The Larch was of excellent form and quality, and had no canker or other disease. At 55 years it had produced a total of 687 cu.m., or 12·5 cu.m./ha./year. C.a.i. is 13·6 cu.m./ha. After the last thinning it had 282 cu.m./ha. in 386 trees of mean diam. 31·5 cm. and mean height 20·0 m. The Silver Fir understorey had produced a total for its 34 years of 123 cu.m., or 3·6 cu.m./ha./year, its c.a.i. being 9·8 cu.m./ha. After the (22%) thinning in 1947 it contained 96 cu.m./ha. in 1,959 trees of mean diam. 13·1 cm. and mean height 9·7 m.

As Larch produces excellent timber and is also acceptable for sulphate pulping, there is every reason to consider introducing it on a larger scale if canker-free, straight-growing forms can be obtained.

In the two cases here reported on, the provenance of the parents was unknown.

2358. ANDERSEN, M. **Growth and yield of Japanese Larch in Denmark.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (17–8).

Exact measurements were made of *ca.* 500 stems of Japanese Larch from all parts of Denmark, and tables prepared giving form factor as a function of (*a*) mean height and diameter of mean basal area, and (*b*) mean height and mean form class. Comparisons show that the form factor of Japanese Larch is somewhat higher than those of European Larch or any of the other East Asiatic species of Larch. Height-age curves showed that most of the permanent sample plots belonged to the same quality class, and the yield table accordingly refers only to this class (quality B).

2359. MILLARD, A. Le méleze du Japon. [**Japanese Larch.**] *Bull. Soc. for. Belg.* 56 (10), 1949 (377–82). [F.]

Silvicultural requirements, increment, and utilization of *Larix leptolepis* in Belgium. Measurements of trees in the province of Luxembourg, planted in 1917, showed that mean annual increment 1917–39 was 11·09 cu.m., 1939–49 17·14 cu.m., and 1917–49 (31 years) 13·276 cu.m.

2360. HUMMEL, F. C. **Revised yield tables for Japanese Larch in Great Britain.** *For. Rec. For. Comm., Lond.* No. 1, 1949. pp. 14. 10 refs.

The present tables are based on considerably more material than their predecessors; since 1935 (the date of the last revision), remeasurements in the older sample plots as well as data from a limited number of new plots, have added to the knowledge of rate of growth of

Japanese Larch and of the thinning treatment it requires. Separate tables are given, for Quality Class I only, for heavy thinnings. The limited experience to date suggests that these do not appreciably affect total volume production and height growth, but do definitely stimulate girth increment. Since heavy thinnings also encourage coarse branching, the early pruning of a selected number of elite trees, say 100–150/acre, up to a height of 14–20 ft. may be advisable.

The present tables and recent literature do not prove, but neither do they contradict, the tentative conclusion that the volume production of Japanese Larch exceeds that of European Larch, at least in the earlier years and that the rate of volume production is much the same in Great Britain as in Japan and elsewhere.

2361. Hilfstafeln für Forsttaxatoren. **[Auxiliary tables for forest mensuration officers.]** Grosshessisches Forsteinrichtungsamt Kassel. 1948. pp. 52. [G.]

Contains the following summary tables (for the species Oak, Beech, Ash, Alder, Birch, Norway Spruce, Scots Pine, Douglas Fir, Larch and Silver Fir, except where omissions are specified): (1) Index to yield tables on which the auxiliary tables are based. (2) For estimating growing stock of regeneration. (3) For estimating volume increments of regeneration. (4) For determining yield classes. (5) Yield table volumes/ha. minus 10% (loss in logging). (6) *Derbholz* increment %. (7) Current annual total *Derbholz* increment minus 10%. (8) Mean total *Derbholz* increment minus 10%. (9) Normal growing stock of a normal felling series, per ha. minus 10% [Douglas Fir omitted]. (10) Normal intermediate yields for 10-year periods, minus 10% [Silver Fir omitted]. (11) Normal stems/ha. and mean diameter [Douglas Fir omitted]. (12) Assortment yield tables [for Oak, Beech, Norway Spruce and Scots Pine only].

2362. Opbrengsttafels voor *Acacia decurrens* Willd. var. *mollis* Lindl. bewerkt naar nagelaten tabellen van Dr. H. E. Wolff von Wülfing, 1945. **[Yield tables for *Acacia decurrens* var. *mollissima* by Dr. H. E. Wolff von Wülfing, revised after his death.]** *Tectona* 38 (5), 1948 (283–90). [Du.E.]

6. MANAGEMENT. WORKING PLANS. SURVEYS

See also *For. Abstr.* 11 (Nos. 2202, 2387, 2404–5, 2428).

2363. MANTEL, W. Forsteinrichtungslehre. **[The theory of forest management.]** Verlag Neumann—Neudamm, Hamburg (obtainable through J. D. Sauerländer's Verlag, Frankfurt/M.I.) 1949. pp. 229. 174 refs. [G.] Price DM 12 [£1. 3*s*. 6*d*.].

A textbook for students, aiming at an up-to-date, systematic account of the subject, without assuming too much previous knowledge but covering the whole field in considerable detail under 3 main sections dealing with the bases of management (factors connected with time and space, growing stock and increment, exploitation), theory (methods, determination of the objects of management, and planning—including chiefly spatial arrangement, silvicultural planning and yield regulation), and practice (working methods in general, special cases—including selection forest, coppice, forest under conversion, peculiarities of ownership and size etc.—and miscellaneous questions). A final section very briefly reviews the history of forest management. There are practically no graphical or tabular illustrations.

60. GENERAL LAND MANAGEMENT

60.2. *Management of Tree Plantations under Non-forest Conditions*

2364. El problema de la leña en los campos. **[The firewood problem in agricultural areas.]** *Agric. trop., Bogotá* 5 (4), 1949 (40–1). [Span.] A.P.B.

Suggests that the practice of obtaining firewood by cutting down shade trees in coffee plantations in Colombia could be avoided by forming special mixed stands for fuel production, and names some suitable species.

60.3. *Management of Different Classes of Forest*

2365. HAGFORS, M. E. A. Yksityismetsiemme tila liiketieteen kannalta. **[The condition of private forests from the point of view of business economy.]** *Metsät. Aikak.* 1948 (7/8), (209–11). [Fi.]

The writer urges a revolution in the silviculture and management of Finnish private forests. Since all species, even Spruce, are suitable for growing in regular stands, and since scattered selection fellings do not seem to yield substantial quantities of all timber assortments, he advocates a change to uniform working, based on forest types. This would afford the private owner a reliable basis for the annual yield and a concentration of work leading to improved, better stocked stands. Selection cuttings should be confined to the better forest types and light increment fellings to valuable timber trees. Poor-site forests should also have shorter rotations, confining their production to small timber and pulpwood, always provided that future markets can absorb such produce.

2366. RICHARDS, E. G. **Private forestry —Denmark.** *Scot. For.* 3 (4), 1949 (13–5).

2367. NEETZEL, J. R. **Farm-woods management in Southern Minnesota.** Lake States Forest Experiment Station, St. Paul, Minnesota. 1949. pp. 28. 23 refs.

61. SURVEYING. MAPPING

See also *For. Abstr.* 11 (Nos. 2328, 2338–43)

2368. BOON, D. A., and BOTTENBURG, M. VAN. **Forest survey in Indonesia.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (25).

Gives details of the combination of aerial and ground survey employed.

2369. GIERUSZYŃSKI, T. Zastosowanie fotogrametrii przy urzadzaniu gospodarstw leśnych. [**The application of photogrammetry in forest management.**] *Wydaw. pomocn. tech.-gosp. Inst. Bad. Leśn.* No. 16, 1948. pp. 50. 30 refs. [Pol.]

Describes the application of aerial photography to forest surveying and stock-taking. While ground and aerial surveys should be looked upon as complementary, as regards stock-taking the writer rejects Tischendorf's opinion that the volume of stands estimated by aerial photogrammetry cannot be considered accurate. The fact that photogrammetry allows volumes to be estimated for whole forests instead of for individual sample plots, inclines the writer to Hugershoff's opinion that the photogrammetric method of stock-taking has a great future.

2370. SEELY, H. E. **Different survey methods of large areas: aerial photography.** *Proc. World For. Congr.* No. 1, 1949 (53–60). 6 refs. [E.f.]

A general review of methods of air photography and photogrammetry and their forestry application.

2371. LÖFSTRÖM, K. G. **Aerial photography in forest surveys in Finland.** *Abstr.* in *Bull. World. For. Congr* No. 5, 1949 (11–2).

2372. THOMSON, A. P. **Air survey of forest resources in New Zealand.** *Malay. Forester* 12 (3), 1949 (123–8). 5 refs.

The limitations of air photos for direct volume estimates, with special reference to New Zealand conditions, are pointed out. Their use for a primary ecological survey is described.

2373. CROMER, D. A. N. **Aerial survey and photo interpretation in Australian forestry.** *Abstr.* in *Bull. World For. Congr* No. 5, 1949 (9–10).

2374. **Aerial survey.** *Emp. For. Rev.* 28 (3), 1949 (212–4).

Summary of a progress report on aerial surveys so far carried out in the British Empire, issued at a meeting of the Technical Committee on Aerial Survey of Forests, set up on the recommendation of the Empire Forestry Conference 1947.

2375. ROGERS, E. J. **A short cut for scaling aerial photos.** *J. For.* 47 (10), 1949 (819–22).

The Northeastern Forest Experiment Station has developed a method for determining the scale for any point on any individual air photo of a photo project. The scale so determined will usually be within 3–5% of the true scale, regardless of the amount of rough land. The method, which is explained in some detail, consists in scaling about 10 photos selected at random from the project, computing from these the average scale at sea level for the entire project, and, from this scale, making adjustments for different elevations (readily done from a graph).

2376. PICKARD, D. E. **Contour maps from aerial photographs.** *For. Chron.* 25 (3), 1949 (209–10).

Describes a method, cheaper and quicker than ground survey, for determining either true or comparative elevations, and drawing contours, from air photographs.

2377. Cosma, D. **Aerial photographs for forestry purposes.** *Abstr.* in *Bull. World For. Congr.* No. 5, 1949 (7–8).

Outlines the method used to calculate the volume of an uneven-aged Oak stand from air photographs on a scale of 1 : 25,000. The resultant figure differed by 1·5% from that obtained by ground measurements.

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

2378. Chodzicki, E. Krainy, dzielnice i obwody leśno-fizjograficzne południowozachodniej Polski. **[Physiographic forest regions, divisions and sections of south-western Poland.]** *Sylwan* 91 (1/4), 1947 (32–82). 24 refs. [Pol.e.]

The writer emphasizes that methods of management, and especially the choice of species, are dependent on site characteristics. In his article he gives detailed suggestions, with a map, for the division of the forests of the Cracow Conservancy into forest regions and lesser units according to altitude, type of soil and type of forest and ground vegetation.

2379. Trampler, T. Nowa metoda klasyfikacji siedlisk leśnych. **[A new method of classifying forest sites.]** *Sylwan* 91 (1/4), 1948 (108–23). [Pol.e.]

The writer gives a short critical summary of the various existing methods of estimating the quality of forest sites. He suggests a 'synthetic' method of his own based on an analysis and grouping of data collected during a survey of the Niepolomucki Forest (Pine and Oak of 100–120 years, Lime, Hornbeam, Alder 60–80 years) near Cracow, in the course of which all trees of mature and intermediate age classes were measured. According to his method the average height of each of the various species represented in the stand, as well as the composition of the ground vegetation, serve as a criterion of site quality. Stands with similar types of ground vegetation, and in which the same species show similar average heights can be grouped in the same quality class. The writer considers the average height of every tree species represented in the stand to be a better means of estimating the site quality than the height and d.b.h. of the chief species alone, with the composition of the ground vegetation constituting a useful check.

2380. Kalela, E. K. Über die Entwicklung der herrschenden Bäume in den Beständen verschiedener Waldtypen Ostpatagoniens. **[The development of the dominant trees in stands of different forest types in E. Patagonia.]** *Suomalaisen Tiedeakatemian Toimituksia, Helsinki (Ser. A.) IV. Biologica* No. 3, 1941. pp. 71. 14 refs. [G.g.]

[Cf. *For. Abstr.* 11 (No. 1677).] The aim of the present work was to investigate the increment and stand development of a range of tree species in relation to forest types in Cajander's sense. Detailed results of the work on forest types, which was done simultaneously by the author's brother, A. Kalela, were to be published separately, but are briefly outlined in the present paper. The mensurational results, given in tables and graphs, are separately discussed under the species: *Nothofagus dombeyi, Libocedrus chilensis, Fitzroya patagonica, Saxegothea conspicua* and *Laurelia sempervirens, Nothofagus procera* and *obliqua, N. pumilio, N. betuloides*, and *N. antarctica.*

Though the forest types proved to offer more complex problems of classification than those of N. Europe, yet the evidence collected is considered to show that such a classification is not only possible but would probably represent the most useful basis of site classification for increment studies and silvicultural purposes.

Among conclusions, it is believed that *Libocedrus chilensis* has considerable possibilities as an economic species in the regions now dominated by *Nothofagus dombeyi* and *N. obliqua*, especially for the afforestation of burns in the former type. *N. procera* similarly appears worth trying in the economically inferior *N. dombeyi* forests.

65. DESCRIPTION OF GROWING STOCK

See also *For. Abstr.* 11 (Nos. 1735, 2361).

2381. Staebler, G. R. **Predicting the volume and normality of reproduction stands of Douglas-Fir.** *J. For.* 47 (10), 1949 (828–33). 6 refs.

The object of this study was to devise a method for predicting the approach to normal stocking and the volume of reproduction stands of Douglas Fir. Such young stands are measured by the stocked-quadrat method, and this expression of stocking is related to normality by cu. ft. volume at 20–30 years of age as determined from yield tables. Field work consisted in measuring over 70 temporary $\frac{1}{20}$-acre sample plots. In analysing the data, a combination of least squares and graphic methods was used. The results of the study are shown in curves and tables giving predicted % of normal stocking and volume after 15 years for stands of a given present stocking, age and site.

2382. ZILLGITT, W. M. **Basal area in merchantable trees as an expression of stocking in Northern hardwoods.** *Tech. Notes Lake St. For. Exp. Sta.* No. 324, 1949. p. 1.

Includes a table showing bd.-ft. stocking/acre equivalent to 64 sq. ft. of basal area for varying percentages of cull.

66. YIELD REGULATION. SUSTAINED YIELD

See also *For. Abstr.* 11 (No. 2403).

2383. SAARI, E. La notion du rendement soutenu. **[The principle of sustained yield.]** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (50–1). [F.]

2384. HEIBERG, H. H. H. **Measures for ensuring sustained yield in forestry.** *Proc. World For. Congr.* No. 1, 1949 (116–21). [E.f.]

Reviews the circumstances of the past quarter of a century which are favourable to sustained-yield management in Scandinavia, e.g. increased industrial demand for small timber, cheap money, and the amelioration of the climate, which is increasingly favourable to natural regeneration.

The need for further silvicultural research is emphasized, and the provisions of the Norwegian Forest Protection Law (1932) are summarized.

2385. GRØN, A. H. **Forest policy and sustained yield.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (43–5).

2386. CHAMPIØN, H. G. **Sustained yield management in Western America.** *Emp. For. Rev.* 28 (3), 1949 (222–5).

An account of the Sustained Yield Units in Washington and Oregon [cf. *For. Abstr.* 9 (Nos. 1984–5)] and the somewhat similar Forest Management Licenses in British Columbia [cf. *For. Abstr.* 10 (No. 1503)].

7. FOREST ECONOMICS, VALUATION, AND FINANCE

2387. DIETERICH, V. Forstliche Betriebswirtschaftslehre: Bd. II. Waldwertschätzung. **[Theory of the economics of forest management: Vol. II. Forest valuation.]** Paul Parey, Berlin. 3rd (rev.) ed., 1945. pp. viii + 189. Many refs. as footnotes. [G.] Price [£1. 2*s*. 6*d*.] Bd. III: Erfolgsrechnung—Zielsetzung. **Vol. III. Assessment of economic success. Determination of the objects of management.]** Paul Parey, Berlin and Hamburg. 2nd (rev.) ed., 1948. pp. vi + 338. Many refs. as footnotes. [G.] Price [£2. 4*s*. 0*d*.]

[For. Vol. 1 see *For. Abstr.* 8 (No. 2817).] Vol. 2 has main sections on:—Principles determining prices; determination of the numerical data to be used in valuation; and methods of value estimation. The author insists on the word 'estimation' and rejects the classical formulae of the *Bodenreinertragslehre* (theory of the highest rate of interest on soil value) in favour of a more empirical approach based on analysis of actual conditions [cf. Vol. 1], which leads up to his proposals for the reform of forest valuation. These he details in respect of whole enterprises and felling series managed on a sustained basis, individual stands or portions of a forest, estimation of soil value, and questions connected with taxation and forest rights.

Vol. 3 deals first with the principles and methods of assessing economic success, from which the author develops his own proposals at length, with special attention to the background of accountancy required. The second half of the volume examines in similar fashion

the principles and methods of determining the objects of management in the widest sense.

Both volumes have a subject index.

74. VALUE OF THE STAND. VALUE OF THE FOREST

See also *For. Abstr.* 11 (No. 2251).

2388. DANHOF, G. N. Rendering van het bosbedrijf. **[Financial returns in forestry.]** *Tectona* 39 (2), 1949 (170–5). 3 refs. [Du.e.]

It is argued that when the returns from a forest enterprise are expressed as a % of the total capital invested, the result depends largely on the way in which the rotation has been fixed. With the aid of a fictitious example the differences in value of the soil are calculated for (*a*) financial rotation, (*b*) rotation of the highest average yield, and (*c*) rotation of highest interest. The conclusion is that a comparable rate of interest can be obtained only if the real market value of the soil is used in all cases.

76. MANAGEMENT STATISTICS

See also *For. Abstr.* 11 (Nos. 1715–6, 1760, 1775, 1936, 2012).

2389. MACGREGOR, J. J. **The forest economy of three private estates in Great Britain.** *Inst. Pap. imp. For. Inst., Oxf.* No. 25, 1949. pp. 95.

Records for the 3 estates extend over the years 1907–46, 1914–46, and 1883–46 respectively. Each is analysed separately, and each section has its own tables and summary.

2390. JAMES, N. D. G. **The cost of forest operations.** *Quart. J. For.* 43 (4), 1949 (176–8).

Figures of costs for clearing and planting woodland in the Cotswolds in 1948 and 1949. Total costs are broken down into those for clearing, rabbit fence, planting (method specified) and overhead (25% of labour costs).

2391. HOLT, L. **Cellulose production in Canadian forests.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 70 (F–1), 1949. pp. 8. 2 refs.

In connexion with the conception that the yield of pulpwood forest should be measured in terms of cellulose production rather than volume of green wood, the author discusses a paper by Burger on production of pure and mixed stands, and one by Hale and Prince on density and rate of growth of Spruces (White, Black and Red) and Balsam Fir in Eastern Canada [cf. *For. Abstr.* 2 (p. 142)]. Site, it is concluded, is the governing factor of wood production, and on sites of similar quality different species tend to produce the same amount of wood. It is therefore impossible to determine what is the 'preferred species' of the 4 mentioned above, merely by growth potential; other considerations such as reproductive capacity, resistance to insects and fungi, fire susceptibility, and uses other than pulp and paper will have to be considered. From the point of view of pulp manufacture, density of wood is one of the most important factors, and this depends very largely on site quality, poor sites producing the densest wood. Spruce is generally more desirable for the pulp and paper industry, but Balsam Fir reproduces much more readily on cut-over sites. The problem of management therefore demands an answer to the question 'How much per acre can one afford to spend now on silvicultural measures to obtain Spruce rather than Balsam, in order to save *X* dollars (the saving in manufacturing costs of Spruce over Balsam) in 60–80 years' time?' This question can be answered only by the joint efforts of forester and mill operator.

8. FOREST ADMINISTRATION

82. LABOUR QUESTIONS

See also *For. Abstr.* 11 (Nos. 1916–7, 1921).

2392. REINHOLD, M. Leistungslohn und Arbeitsbewertung. **[Payment by results and evaluation of work.]** *Die Forstarbeit, Hamburg* 3 (1), 1949 (3–6). 1 ref. [G.]

Part I of the article comprises a synthesis of papers read at the wages committee conference of the Employers of the United Economic Zone (*Vereinigtes Wirtschaftsgebiet*) held in Bad Nenndorf, Aug. 1948. The advantages of payment by results were stated, and methods of evaluating work discussed. In Part II ways of applying the system to forestry operations are

considered, with particular reference to stump removal and enterprises associated with Geffa (*Gesellschaft für forstliche Arbeitswissenschaft*). Operations are listed and graded according to skill and knowledge required, responsibility etc. and the grades are divided into 5 wage classes, for which hourly payments in DM are calculated.

2393. Aro, P. **Co-ordination of distribution of working time and of methods of tool study in forest work studies.** *Abstr.* in *Bull. World For. Congr.* No. 7, 1949 (5–6).

A plea for standardization in time studies of logging operations and tool studies.

2394. Zehnder, J. **Some considerations on methods of job investigations.** *Proc. World For. Congr.* No. 1, 1949 (141–6). [E.f.]

2395. Starčević, J. Elementi normiranja u drvnoj industriji. [**Bases for determining production targets in the timber industry.**] *Šum. List* 72 (7), 1948 (212–30). [Croat.]

Methods for the reliable determination and review of saw-timber production targets are examined and discussed.

2396. Hviid, A. **Technical education of forest labourers [in Denmark].** *Abstr.* in *Bull. World For. Congr.* No. 7, 1949 (7–8).

2397. La sylviculture en face des travailleurs de bois. [**Silviculture and forest workers.**] *Proc. World For. Congr.* No. 2, 1949 (62–75). [F.e.]

FAO paper discussing the problem of providing continuous employment and social amenities for forest workers.

2398. Ender, R. **The forest worker question in Austria, from the point of view of forest policy.** *Abstr.* in *Bull. World For. Congr.* No. 9, 1949 (24–5).

2399. Klimek, H. **Employment and unemployment in Polish forestry management.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (52–4).

2400. Laaksonen, Y. W. **Employment and unemployment in Finnish forestry.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (55–7).

2401. Shirley, H. L. **Employment and unemployment in forestry [in the U.S.A.].** *Proc. World For. Congr.* No. 1, 1949 (122–40). 19 refs. [E.f.]

9. FOREST POLICY

90. GENERAL PRINCIPLES OF FOREST POLICY

See also *For. Abstr.* 11 (Nos. 1566–71, 2382–6, 2417).

2402. Staner, P. Organisation de l'exploitation forestière au Congo belge. [**Organization of forestry production in the Belgian Congo.**] *Proc. World For. Congr.* No. 1, 1949 (147–62). [F.e.]

Reviews (1) the recent forestry decree for the Belgian Congo, dealing largely with reservation, (2) recent developments in the exploitation of tropical forests, and (3) the fundamental conditions of exploitation of tropical forests.

2403. Mijers, W. N., and Sewandano, R. **Measures for safeguarding sustained yield in Indonesia.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (48–9).

2404. Kools, J. F. **Economics and policy of exploiting virgin forests in the tropics.** *Proc. World For. Congr.* No. 1, 1949 (85–94). [E.e.f.]

Exploitation in Indonesia ranges from the intensively managed Java Teak forests to the wild *Intsia* on the coast of New Guinea. In the 1920's, intensive operations with heavy capital investment were made in several places, but failed. The present successful intensive operations are confined to forests with plenty of labour, good transport systems, and sufficient quantities of marketable timber. Current extensive exploitation is characterized by a minimum of fixed capital (i.e. no permanent railways or other fixed installations and no long-term management). The necessary preliminaries to successful exploitation of tropical virgin forests are:—(*a*) Surveying, preferably from the air; (*b*) statistically sound sample enumerations; (*c*) botanical investigation for the

purpose of constructing a key from vernacular to scientific names and *vice versa*; (*d*) study of the (log) transport problem; (*e*) study of the labour problem; (*f*) study of the problem of shipping logs from the port to utilization centres; (*g*) final calculation of cost price.

2405. LIHTONEN, V. **Economics and policy of exploiting virgin forests.** *Abstr.* in *Bull World For. Congr.* No. 6, 1949 (5–7).

With reference to conditions in Northern Finland, where virgin forest is for the most part remote from all means of transport.

2406. BLANFORD, H. R. **Forest policy in the British Commonwealth of Nations.** *Emp. For. Rev.* 28 (3), 1949 (216–21). 16 refs.

The progress of forest policy in the British Commonwealth of Nations is reviewed. The note records recent progress, especially in Canada and the U.K., and shows that the scarcity of indigenous forests in South Africa has led to greater advance in a policy of afforestation than in other countries which were able to supply their requirements either internally or by imports. The lack of a declared policy in many countries is prolonged by the failure to complete a survey of forests and forest resources. *From author's summary.*

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST. NATIONAL PARKS. RESERVES. FOREST INFLUENCES

See *For Abstr.* 11 (Nos. 1609, 1616–7, 1719, 1791, 1818, 2280, 2287–8, 2397–40, 2407).

92. FOREST LAW

See also *For. Abstr.* 11 (Nos. 2384–5, 2402–3).

2407. **National Parks and access to the Countryside Bill: Debate on second reading.** *Parliamentary Debates* (*Hansard*): *House of Lords off. Rep.* 164 (110; 111), 1949 (880–937; 951–1011).

2408. **New Forest Bill: Money resolution reported and agreed to: Bill considered in Committee; reported, with amendments; read the third time.** *Parliamentary Debates* (*Hansard*): *House of Lords off. Rep.* 468 (165), 1949 (492–524); 469 (175), 1949 (215–86).

2409. JOHANSSON, F. **Some features in modern Swedish forest legislation.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (46–7).

94. FOREST OWNERSHIP. CO-OPERATIVES

See also *For. Abstr.* 11 (No. 2386).

2410. HESKE, F. **Report concerning the expropriation of private forest estates in Schleswig-Holstein.** [1949]. pp. 15. [E.] [Centralinstitut für Forst- und Holzwirtschaft, Hamburg-Reinbek.]

2411. Les combinats sylvicoles. **[Forest combines [co-operative producer/processer units].]** *Proc. World For. Congr.* No. 2, 1949 (49–61). [E.f.]

A paper put forward by FAO, discussing the difficulties involved in organizing forest combines (*a*) in the tropics, and (*b*) in industralized, temperate regions.

2412. PLAIR, T. B. **Snohomish forestry.** *J. For.* 47 (11), 1949 (877–81).

An account of the progress of farm forestry in Snohomish County, Washington, the formation of the Washington Forest Products Co-operative Association, and the 35-year contract made in 1948 between it and a group of mill owners (The Cascade Forest Industries Inc.), by which the latter will purchase all the woods products of the members of the co-operative at set prices quarterly.

Douglas Fir second-growth stands in Snohomish have been thinned 3 times, using the tree-marking rules developed there. Indications are that Douglas Fir may be carried through many short cutting cycles during the rotation.

95. FOREST TAXATION, LOANS AND INSURANCE

See also *For. Abstr.* 11 (No. 2251).

2413. GRANDCOURT, O. DE. L'impôt et la forêt. **[Taxation and the forest.]** *Bull. Soc. for. Franche-Comté* 25 (11), 1949 (446–50). [F.]

Discusses the law of Dec. 9 1948 [cf. *For. Abstr.* 10 (No. 2373)] which substituted a

proportional tax on yield (in principle 18%) for the previous tax on capital, for agriculture and forestry, and the recent decrees modifying it, which considerably increase the burden of taxation.

96. POLICY REGARDING PROTECTION FOREST, DEFORESTATION AND AFFORESTATION

See also *For. Abstr.* 11 (Nos. 1591, 1677, 1788 *et seq.*, 2380).

2414. PROKOPLJEVIĆ, N. Prilog analizi šuma Vojvodine. **[An appendix to the analysis of the Vojvodina forests.]** *Šum. List* 72 (8), 1948 (267–71). [Croat.]

Under the former regime, and then enemy occupation, these forests have been excessively felled and neglected, and such working plans as existed are hopelessly out of date. The author proposes a thorough inventory as a basis for their rehabilitation through sound management.

2415. COLLEAUX, L. Houille blanche et conservation du sol. **[Water power and soil conservation.]** *Bull. agric. Congo belge* 40 (2), 1949 (1317–44). 26 refs. [F.]

Discusses the necessity for protecting the forests of the Belgian Congo, and the present utilization of wood, particularly as locomotive fuel; compares the yield of power from wood (1) per kg., (2) per ha. of (*a*) mountain forest, (*b*) plantations, with water power; and finally gives a draft of a decree for regulating the industrial use of water. It is calculated that the use of a head of water of 5 litres/sec. with a fall of 1 metre, would save 1 ha. of mountain forest; 400 l./sec. with a fall of 25 m. would produce power equivalent to that from 250 ha. of forest or 45 ha. of plantation; and in producing 100 KW by hydro-electric power rather than by steam, there is a saving of 3,000 ha. of forest or 650 ha. of Eucalypt plantation.

2416. VAISSIÈRE, J. DE. Politique de reboisement et implications économiques. **[Afforestation policy and its economic implications.]** *Proc. World For. Congr.* No. 1, 1949 (95–108). [F.e.]

Reviews briefly the afforestation policy of governments in the U.S.A., Great Britain, France and the U.S.S.R.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

See also *For. Abstr.* 11 (Nos. 1591, 1609–10, 1618, 1677, 2383, 2403, 2409, 2415).

2417. MANTEL, W. Forstliche Planung: Grundriss der forstlichen regionalen Planungstechnik. **[Forestry planning: outlines of the technique of regional planning in forestry.]** *Forstw. Praxis, München* No. 5, [1949]. pp. 67. 23 refs. [G.]

A systematic exposition of the subject, under the following heads:— I. *Regional fact-finding*: (1) General requirements; (2) Methods; (3) Forestry and timber statistics; (4) Special forest surveys for the purposes of regional planning; (5) Special studies of small areas; (6) Special features of timber-balance statistics. II. *The technique of planning*: (1) General methods of evaluating the data; (2) 'Spatial planning' (distribution of the forests); (3) Planning of forest management (in the broad sense, including silviculture) over large areas; (4) Regional planning of forest exploitation; (5) Planning of timber supply (the balancing of demand and supply).

2418. BERESFORD-PEIRSE, H. C. **Relation of forestry to agriculture in rural economy.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (22–3).

With reference to conditions in Scotland, particularly in hill sheep-farming areas.

2419. DUSCHEK, S. **Relations of forestry to agriculture in rural economy [in Austria].** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (25).

2420. GLINKA, Z., and PIATKIEWICZ, W. **The relation between agriculture and forestry [in Poland].** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (28–30).

2421. OSARA, N. A. **Relations of forestry to agriculture in rural economy [in Finland].** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (31–2).

2422. OUDEMANS, T. C., and HALBERTSMA, S. J. Relations entre l'agriculture et la forêt

dans l'économie rurale. **[Relations of agriculture and forestry in rural economy [in the Netherlands].]** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (33–4). [F.]

2423. BOTTENBURG, M. VAN. **Forestry as related to agriculture in the rural economy of Indonesia.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (24).

2424. HAAN, J. H. DE. Het Bureau der Landinrichting. **[The Bureau of Land Utilization.]** *Tectona* 39 (1), 1949 (97–116). [Du.e.]

An account of the functions and organization of this branch of the Indonesian Department of Agriculture, set up in 1948. The scope of the Bureau is roughly comparable with that of the U.S. Soil Conservation Service.

2425. ALLAN, W. **Studies in African land usage in Northern Rhodesia.** Rhodes-Livingstone Papers (Oxford University Press). No. 15, 1949. pp. 86.

The four papers included in this publication deal with a method of estimating land carrying capacities for human populations under African conditions and systems of land usage, and the application of this method to the study of practical problems. The method is based on Trapnell's work on the soils and agricultural systems of the territory [cf. *For. Abstr.* 10 (No. 96)]. An appendix gives a note on the *chitemene* control scheme. The *chitemene* system [cf. *For. Abstr.* 10 (No. 889)], if it is not to lead to deforestation and degradation of soils, requires 120–200 acres of woodland to provide for one annual acre of millet in perpetuity. The essence of the control scheme was the spreading of villages evenly over the reserves, so that each could be allotted a demarcated 'village cutting area' sufficient, with increased care of regenerating woodland, to provide for their *chitemene* gardens in perpetuity. Each village area was divided into 15 annual cutting blocks, and lopping outside the block allotted to a particular year was prohibited during that year. Early burning is carried out to protect the regenerating blocks from fire.

2426. FARRON, P.-E. Aménagement sylvo-pastoral. **[Forestry combined with pasturage [in mountain areas].** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (26–7). [F.]

The principle recommended is that pasture should be fenced off from, but scattered among, the forested areas, which should be confined to the poorer soils inaccessible for manuring.

2427. WATERER, R. R. **Forest grazing.** *Rep. For. Dep. Cyprus 1947 and 1948*, 1949 (5–6 + map).

Outlines the problem of forest grazing in Cyprus and reviews the progress made in the application of the Goats Law and the Village Tree Planting Law. Both laws can only be applied at the request of the villagers who, by a ballot, can vote (1) to exclude free-grazing goats from the village area, (2) to set aside an area of the village land for tree planting. When (1) is applied, each family is allowed to keep 3 tethered goats for its essential milk requirements. Up to the end of 1948, 234 out of the 627 villages in Cyprus had applied the Goat Law, and 120 villages the Tree Planting Law.

2428. STREYFFERT, T. **The effect of industrial and chemical development on silviculture and forest management.** *Proc. World For. Congr.* No. 1, 1949 (208–18). [E.f.]

From the silvicultural point of view the greatest importance of recent developments has been the possibility of utilizing smaller trees and hitherto valueless species. In many regions, notably in Northern Europe, it is essential to regeneration, whether natural or artificial, to be able to clear the reproduction areas from any residual stand of slow-growing small trees and brush. The significance of the pulp industry in this respect, rendering possible a rational silviculture in thinly populated areas where such wood is unsaleable as fuel, cannot be over-estimated. The pulp industry has also made silviculturally desirable thinnings economically possible. The writer considers that the difference in current prices between high-quality, large dimensions of timber, and inferior, smaller dimensions, is not sufficient to encourage the silvicultural measures necessary to ensure a supply of the former when existing virgin stands are exhausted. The increasing substitution of steel for structural timber and the use of plywood, fibreboard and laminated beams, are influences in the same direction.

2429. BUDNIAK, F. **The problem of dependence between wood-working industries and forestry in Poland.** *Abstr.* in *Bull. World For. Congr.* No. 6, 1949 (37–9).

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References: 1. *Annual Report, New Zealand State Forest Service*, Wellington. 2. *Annual Report, Tennessee Valley Authority*. 3. *Bois et Résineux*, Bordeaux. 4. *British Columbia Lumberman*, Vancouver. 5. *Commonwealth Survey*, London. 6. *Crown Colonist*, London. 7. *Erdészeti Lapok*, Budapest. 8. *FAO Leaflet*, Washington. 9. *Foreign Commerce Weekly*, Washington. 10. *India News*, London. 11. *India Record*, London. 12. *Journal of the Land Agents' Society*, London. 13. *Las Polski*, Warsaw. 14. *Malayan Forester*, Kuala Lumpur. 15. *Monde forestier*, Quebec. 16. *Nature*, London. 17. *Naval Stores Review*, New Orleans. 18. *Quarterly Journal of Forestry*, London. 19. *Quarterly Review of the Timber Development Association*, London. 20. *Revue internationale du Bois*, Paris. 21. *Southern Lumberman*, Nashville, Tenn. 22. *Sylwan*, Warsaw. 23. *Timber Trades Journal*, London. 24. *Times*, London. 25. *Unasylva*, Washington.

Conferences. A course on forestry in Scotland will be held during 11-23 Sept. 1950 under the auspices of the British Council, and arranged by the Forestry Department of the University of Aberdeen in conjunction with the Forestry Commission. This course is intended for staffs of State Forest Services and of academic and research institutions in Commonwealth and foreign countries. The number of participants will be limited to 20 and they must be proficient in English. Topics will include the research which is being conducted at the University of Aberdeen on Scots Pine and the so-called Scottish race of European Larch. The reforestation work of the Forestry Commission and the working of the Government scheme for the dedication of British woodlands will also be considered. Further information can be obtained from the Area Officer, British Council, 22 Bridge Street, Aberdeen (**16**; 24.12.49).

FAO. Among the recommendations made to the 5th session of the FAO Conference by the Commission dealing with organization etc. are the following:—That the FAO Conference meet biennially henceforward, with the proviso that each session may decide to meet in the off year as well. That Spanish be adopted as the third working language of the Conference. That the Far Eastern Regional Office remain at Bangkok. At a plenary session, the Conference voted 30 to 28 to move FAO headquarters to Rome. The decision, reached on a 5th ballot shortly after midnight, came after 5 hours of debate on voting procedure (**8**; Dec. 1949).

Dr. M. A. Huberman has been appointed chief of forestry and forest products at the regional office of FAO at Bangkok. This new post resulted from the FAO conference at Mysore, March-April 1949, which recommended that a forestry and forest-products working group should be set up for south-east Asia (**16**; 30.7.49).

British Guiana. An area of *ca.* 500 sq. miles of forest has been leased to the Colonial Development Corporation for exploitation of its timber resources under an agreement with the Colonial Government. Two existing sawmills at Georgetown and at Bartica will continue to handle the output from the forests until the erection of a large modern sawmill is completed. This mill is to have a capacity of 40,000-50,000 tons of logs a year, and an annual production of 18 million bd. ft., $\frac{2}{3}$ of which would be exportable, is expected. The bulk of the timber extracted will be Greenheart (*Ocotea rodiaei*), Mora (*Mora excelsa*) and Morabukea (*M. gonggrijpii*) (**23**; 14.1.50).

Canada. The British Columbia Loggers' Association has leased to the University of British Columbia a tract of 9,600 acres of forest to serve as a training ground for forestry students. Among the projects to be undertaken are a programme of thinning and pruning in certain areas, and a forest inventory (**4**; Oct. 1949).

J. E. Fleury, an engineer of the Three Rivers Co., claims that he has invented a device which makes possible the effective longitudinal grinding of pulpwood without the waste of material which has hitherto been the great drawback of longitudinal grinding [cf. *For. Abstr.* 10 (Nos. 438-9)]. The device, which has been patented, can be adapted to all existing types of grinder at very small expense. By the use of this method of grinding, which gives longer and better-quality fibres than does transverse grinding, hardwoods give as good results as softwoods (**15**; Dec. 1949).

A company has recently been formed in Ontario for the manufacture of cigarette paper from fruit-tree wastes [? pruning waste]. The process to be used has been patented and a factory with a capacity of 10 metric tons/day is to be built. It is said that the paper can be manufactured at a cost of $220.00/short ton, f.o.b., at the factory (**15**; Dec. 1949).

Ecuador. The Balsa-wood industry, which contracted a great deal after the end of the war, has had an increase of 20% in production since Nov. 1948. This was due chiefly to building activity in Guayaquil, where Balsa is used both in light house-construction and in building forms for concrete. There is also an increasing foreign demand and new uses are being found for Balsa, especially as plywood core stock and in door construction. An attempt to create a demand for Balsa as an insulating material has met with little success so far. It has been noticed recently that the heavier grades (12-16 lb./cu. ft.) are fetching a better price than the lighter, which were formerly the more popular.

An allotment of 2,000,000 sucres has been made by the government for stimulating afforestation projects. Amongst the projects to be assisted are two experimental plantations already established in the coastal area, one growing a fast-growing tropical tree, *Cedrela odorata*, and the other growing Abaca [*Musa textilis*] for fibre (**9**; 7.11.49).

France. A demonstration was recently given on the Château-Yquem estate at Sauternes, of mechanical cutting of heather and its use as litter for making farmyard manure. The motor mower has a horizontal saw-blade and will clear undergrowth of heather etc. in woodland more cheaply than previous methods. Manure made with the material so obtained is of great value for the vineyards of the region (**3**; 20.12.49).

Cutting of burnt timber in the Landes forests is expected to be completed in 6 months, though some of the labour may have to be transferred from the pool of French workers in the Black Forest area of Germany. It is estimated that *ca.* 1,800,000 cu.m. of the damaged timber will be used for pitprops and pulpwood and the remaining 2,400,000 cu.m. will be used to produce *ca.* 1,200,000 cu.m. of sawn softwood (**9**; 5.12.49).

Germany. A small group of experts, nominated by the Timber Committee of O.E.E.C. is studying the employment of Bamboos and Palms as pitprops. Experiments are to be made in the Ruhr coalmines (**20**; Dec. 1949).

Great Britain. The Forestry Commission's latest project involves the acquisition of 20,000 acres in the upper Towy region of mid-Wales. Over a period of 40 years, 16,000 acres will be afforested, mostly with softwoods (**23**; 26.11.49).

African Mahogany (*Khaya* sp.) was used as a substitute for Teak in decking on the Elder Dempster M.V. *Apapa* laid down about 2 years ago. On exposed decks, though a little darker than Teak, the Mahogany has bleached out well; on unexposed decks the darker colour is still noticeable. The general appearance of the decks is good and the percentage of shakes very low, but there was a tendency to 'woolliness' on the surface. In general this timber could be classed as a decking timber of the softer category (**19**; Jan. 1950).

Actumus, a compost accelerator described as a concentration of hormones derived from the breakdown of forest litter, is available in a new concentrated form. It is claimed that if the material is mixed with sawdust, the mixture may be applied to the soil at the rate of $3\frac{1}{2}$-4 tons/acre. The cost is fairly high, but the proprietary company hope to reduce it considerably (**19**; Jan. 1950).

The Board of Trade announced on 23 Nov. 1949 that the prices of all home-grown timber (standing, in the round, mining, and converted) were to be freed from price control from Dec. 1, 1949. There is no change in the licensing arrangements of trees for felling, and licences for consumption of home-grown softwoods and Ash will still be required (**18**; Jan. 1950).

A thatcher upholds the merits of Hazel over Willow for spars and spraywood. The life of Hazel, when exposed to the weather, is 7-10 years, while Willow seldom lasts more than 3 or 4. Hazel, when entirely covered with straw, will last indefinitely. In Kent recently, when replacing the wattle and daub panels of a cottage wall with brickwork, Hazel wattle was found to be absolutely sound; it could hardly have been less than 200 years old (**12**; Dec. 1949).

A successful method of raising Oak has been used recently. A furrow is ploughed out with a Ferguson tractor and acorns scattered along it, the earth being kicked back over the acorns as soon as they are sown. The furrows are ploughed 4 ft. apart, and the acorns germinate well, providing belts of young seedlings every 4 ft., which should provide ample opportunity for selection (**12**; Jan. 1950).

Hungary. The following are the main objects of the Five-year Plan for forestry: (1) Large-scale afforestation of the Great Plain and waste land elsewhere (a total of 320,000 acres to be afforested in 5 years); (2) the introduction of intensive silvicultural methods, and in the first place the establishment of 10,000-15,000 acres of experimental plots; (3) rationalization of forest transport; (4) establishment of forest chemical industries; (5) foundation of a scientific institute of forestry; (6) wildlife management; (7) intensive training of forest workers of all grades, with the object of securing a total labour force of 150,000 (**7**; May 1949).

India. There are in India 200 match factories with a total capital value of about Rs.42,875,500. No matches were imported into India in 1946-49. Total production of matches in India in 1948 was 533,243 cases of 50 gross of boxes of 60 sticks each (**10**; 24.12.49).

The Government of India have decided to reconstitute the Central Advisory Board on Forest Utilization, providing for representation of industry, agriculture and consumers. The functions of the Board will be:—(1) to advise on the assignment of priority to various items of research conducted at the Forest Research Institute, (2) to co-ordinate research with the needs of industry, agriculture and the general public, and (3) to link research with the needs of the producer and the consumer (**11**; 15.12.49).

About 8,000 acres of *dhak* jungle in the United Provinces is to be reclaimed at an estimated cost of Rs.440,000. Government are also to afforest about 8,000 acres of land in the Ganga Khola area near Hastenapur, over the next 5 years. Quick growing fuel and timber species will be used (**10**; 14.1.50).

Various measures to encourage the use of treated timber have been decided upon by the Government of India. The main object is to substitute treated timber for steel, which is now in short supply. Government departments will be asked to use treated timber for structural purposes in place of steel, and the establishment of a timber-treating plant in each province is to be encouraged. The Forest Research Institute, Dehra Dun, is to organize research in timber engineering (**10**; 14.1.50).

Malaya. Despite the fact that the forest is the retreat of the Communist terrorists, timber production has not been seriously affected and revenue has been maintained at a satisfactory level. It is still impracticable to carry out silvicultural operations to the extent that is desirable, but the marking of fellings in many forest reserves has been resumed and boundaries are being patrolled and maintained. The construction of 5½ miles of extraction road has recently been completed in the Rengam Forest Reserve. Eight of the larger forest sawmills now have a guard of Special Constables stationed on the premises, some of them with ex-police-sergeants from Palestine. The protection of lumbermen is a much more difficult problem, and the most that can be done at present is to carry out regular patrols round the felling areas (**14**; Oct. 1949).

New Zealand. Concern is felt as a result of reports of a considerable increase in the population and range of opossums and damage done by them, in both Islands. Exotic forests have been affected most, the young shoots of several species being chewed and nibbled off. In indigenous forest, a preference for young shoots of Rata [*Metrosideros robusta*] has been noted. Attempts are being made to control opposums by poisoning as a supplement to trapping (**1**; 1948-9).

The 'Manuka blight', which has aroused interest in North and South Canterbury lately, has not so far been found to be detrimental to exotic forest trees. This 'blight', caused by a combination of insect and fungus, is welcomed by many settlers as a means of eradicating young Manuka [*Leptospermum ericoides*] invading pasture lands. The indigenous Manuka, however, is of such great value, both as a nurse for forest seedlings and as an excellent vegetative cover for preventing soil erosion, that the State Forest Service has constantly deprecated suggestions that the 'blight' should be assisted to spread over the whole Dominion (**1**; 1948-9).

Nigeria. Scientific expeditions from the United States, Britain, Switzerland, and other countries, are now at work in Africa collecting the seeds of a plant which has recently became of considerable interest in the treatment of rheumatism. The British expedition is in Nigeria, where it is understood that 'a good many seeds' of the plant (a liane of the genus *Strophanthus*) have been collected. When the expeditions return, it is hoped that a considerable step forward will have been made towards the production of synthetic cortisone for medical research into the treatment of rheumatoid arthritis. Cortisone is a synthetic product, imitating one of the glandular secretions of the human body, and only small quantities have so far been available. It has been found that a substance called sarmentogenin, which is obtained from the seeds of the above-mentioned *Strophanthus* species, considerably reduces the operation of synthesizing cortisone, the basis of which at present is bile (**24**; 29.12.49).

The Nigerian Government, acting on the advice of the Timber Advisory Board, has introduced an optional inspection service for export timber. The inspection plan, which became effective on Nov. 1, 1949, is operated by the Inspection Branch of the Dept. of Marketing and Exports and is free of charge. At the request of the exporter, shipments of logs or sawn timber will be inspected by trained timber inspectors, and a certificate of quality issued after final inspection, when the timber is loaded on board ship. Exporters can also ask for a preliminary inspection and advice on the quality of the consignment before shipment. The inspectors will be stationed at Lagos and Sapele (**9**; 5.12.49).

The proposals which are under consideration for a federal system of government, include the transference of responsibility for forestry and agriculture to the regional legislatures (**5**; 12.11.49).

Poland. A survey of the ground vegetation of the Polish State Forests, begun in 1947, is nearing completion. It is intended to determine the extent and resources of edible berries and fungi, medicinal herbs, and commercially useful plants. A list of species and a map of their distribution will be constructed (**22**; Jan. 1949).

Better methods of mining have led to a decrease in the amount of round pitprops used per 1,000 tons of coal produced, from 21·35 cu.m. in 1947 to 20·49 cu.m. in 1948. On the other hand, there was an increase in the use of sawn timber from 4·83 cu.m./1,000 tons of coal in 1947 to 5·56 cu.m. in 1948 (**13**; Aug. 1949).

Portugal. The forest area in Portugal is estimated to cover nearly 2½ million ha. classified as follows:—Pine 1,161,000, Cork Oak 690,000, Evergreen Oak 360,000, Chestnut 80,000, other Oak 108,000, other species (largely Eucalypts) 68,000. There was serious overcutting during both world wars, and sawlogs are now very scarce. The principal function of the Forest Service is the management of the State forests on a sustained-yield basis, and advising private owners at their own request. An increasing number of private forest owners are said to be turning to scientific management. In 1939 the Forest Service began a 30-year programme of afforestation, which is planned to restore 9,125 ha. of sand dunes and 420,000 ha. of mountain to productivity by converting them to woodland. Up to the present, 34,799 ha. have been planted, including almost the whole of the sand dunes (**9**; 7.11.49).

Swaziland. The Colonial Development Corporation has completed negotiations for the purchase of about 100,000 acres of grassland in the basin of the Great Usutu River in Swaziland, which it is proposed to afforest with suitable species of fast growing conifers. The project, which has as its object the creation of a large forest industry, will initially give employment to some 1,500 people. Later on, a paper mill may be established (**6**; Oct. 1949).

Tanganyika. An East African corporation proposes to establish Wattle plantations in the Southern Highlands Province of Tanganyika, and plans to develop about 30,000 acres during the next 6 years. Eventually it is intended to set up a factory for the production of Wattle extract in the area. A similar project by the East African Tanning Extract Co. was abandoned in 1948 because of lack of capital (**9**; 5.12.49).

U.S.A. Community tree-planting projects have been organized by the assistant county agent in forestry, Benton County, Tennessee, to enable landowners to tackle their erosion problems farm

by farm. Beginning on the headwaters of Cotton Creek, 35 residents of Divider Community contributed their time to plant 28,600 trees on 23 eroded acres. Volunteers in other districts planted 21,600 and 4,800 trees respectively. It is intended to continue these tree-planting 'bees' year after year until all wastelands in the county are reforested (**2**; 1949).

A new type of house made from Palm logs is being developed in Florida. The walls are made of logs set vertically in a thick concrete foundation, and are thus resistant to hurricane winds. They are also practically fireproof. One drawback is that Palm logs cannot be sawn with the grain, and an axe, hatchet, or chisel must be used to trim them for door or window openings (**21**; 15.5.49).

Two new tools for use in resin-tapping have been evolved by the U.S. Forest Service. One combines an acid squeeze-bottle with a bark saw, and the other a saw-blade and cutting edge. In the second tool, the cutting edge is used to shave the rough bark, and the saw to make incisions for gutters and aprons, and the operation is performed by one man instead of the two necessary for the old method (**17**; Dec. 1949).

U.S.S.R. The Zoological Laboratory of the All Union Institute for Plant Protection has developed a method of coating tree seed as a protection against rodents. The substances used are phosphide of zinc (a poison), ammonium chloride (a repellent), flour and water (as binder) and chalk to prevent the phosphide of zinc from decomposing in the soil. Tests have shown that the coating remains intact on the seed in moist soil for a month or more, and that it does not hinder germination. The treated seed produced better developed seedlings than the untreated (**25**; Nov.-Dec. 1949).

Experiments in combating the ravages caused by the larvae of *Amphimallon solstitialis* and related species, by dusting the roots of Pine seedlings with 5% DDT and 6% hexachloran, were conducted in 1948 in two forests of the Kharkov and Pskov provinces. The roots were dusted immediately before planting in heavily infested soils. The workers who did the dusting and planting protected their noses and mouths with gauze and cotton bandages and were cautioned not to rub their eyes. The results were as follows:—(1) Treatment protected Pine seedlings from damage by *A. solstitialis* larvae for the first year after planting, not by killing them but simply by repelling them from the roots. (2) Seedlings dusted with hexachloran showed slower growth than untreated seedlings on control plots, but no such effect was observed in the case of DDT-dusted seedlings. (3) The roots of treated seedlings had a slightly lower resistance to climatic effects. (4) The amount of poison to be used per ha. depends on the number of Pine seedlings to be planted. If planting is at the rate of 10,000/ha., 15-17 kg. should be used; if the rate is 20,000/ha., the amount should be doubled. But these recommendations are tentative and could probably be scaled down (**25**; Nov.-Dec. 1949).

A work for choir, soloists and orchestra in praise of forestry has been composed by Dmitri Shostakovitch, setting to music a poem 'Song of the forests' by Eugenia Dolmatovsky celebrating the afforestation and shelterbelt scheme for the protection of the black-earth regions of the U.S.S.R. (**25**; Nov.-Dec. 1949).